S. HRG. 101-15

ARCTIC COASTAL PLAIN COMPETITIVE OIL AND GAS LEASING ACT

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

on

S. 406

TO AUTHORIZE COMPETITIVE OIL AND GAS LEASING AND DEVELOPMENT ON THE COASTAL PLAIN OF THE ARCTIC NATIONAL WILDLIFE REFUGE IN A MANNER CONSISTENT WITH PROTECTION OF THE ENVIRONMENT, AND FOR OTHER PURPOSES

MARCH 6, 1989

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ARCTIC COASTAL PLAIN COMPETITIVE OIL AND GAS LEASING ACT

MONDAY, MARCH 6, 1989

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 9:30 a.m., in room SD-366, Dirksen Senate Office Building, Hon. J. Bennett Johnston, chairman, presiding.

OPENING STATEMENT OF HON. J. BENNETT JOHNSTON, U.S. SENATOR FROM LOUISIANA

The CHAIRMAN. The hearing will come to order.

The purpose of the hearing this morning is to receive testimony on S. 406, the Arctic Coastal Plain Competitive Oil and Gas Leasing Act. This legislation was introduced by Senator McClure and me on February the 9th. This measure and three amendments which were introduced at the same time comprise essentially the same measure which the committee reported favorably last March; that is, S. 2214.

This is the 10th hearing that this committee has conducted on the issue of opening the coastal plain of the Arctic National Wildlife Refuge (ANWR) to oil and gas exploration, development and production. I should note that last Congress some 23 hearings were conducted by four separate committees in the House and Senate on various aspects of this issue.

The legislation which Senator McClure and I have introduced reflects our sincere belief that, based upon what we have learned over the last two years, it is clearly in the best interests of this nation to look for oil and gas on the coastal plain of ANWR. The legislation also reflects our best efforts at crafting an environmentally sound proposal, a proposal designed to ensure that exploration, production and development of oil and gas occur in an orderly, rational and environmentally responsible manner.

Before we proceed, I would like to respond briefly to two specific objections which have been raised to the bill. First, there are those who contend that the Congress has not been provided sufficient data and accurate data on which to base a decision regarding drilling on ANWR. Much of this criticism has been focused on the so-called "1002 report," the study mandated by Congress in 1980 and completed two years ago, which includes the recommendation of former Secretary of the Interior Hodel that oil and gas leasing activities should take place in ANWR.

These groups argue that the Congress should commission an evaluation of the 1002 report by an independent entity such as the National Academy of Sciences. In other words, they say we should study the study before proceeding. Following such a review, these groups would have us undertake a new 1002 study to re-reevaluate, re-reassess a new 1002 study to re-reexamine, re-restudy and re-reconsider the pros and cons of proceeding to look for oil and gas in ANWR.

I hope that this argument will be rejected. I recognize there are serious differences of opinion on whether the Congress should authorize oil and gas activities in this sensitive area. Based on the extensive record compiled by this and other committees, it is clear that there are legitimate policy issues on which reasonable people can disagree. There are no easy answers and all the studies in the world are not going to give us any easy answers.

Maybe those of us who support development in ANWR will prevail, maybe the other side will prevail. But it is clear that the decision can be made now based upon an accurate and adequate data base and more and more and more studies are just a waste of time and money and the attention of this committee.

A second point I would like to make concerns the provisions of the bill regarding the distribution of revenues from oil and gas leasing activities in ANWR. There have been numerous reports in the press both in Washington and in my own state of Louisiana criticizing me and others for including provisions earmarking 25 percent of these revenues for land and water conservation fund and 15 percent for wetland preservation purposes.

It is alleged that by including such provisions I am offering conservationists and others a bribe to support oil and gas leasing in ANWR and I am holding additional funding for these programs hostage to the development of ANWR.

This is not correct. First of all, on the question of holding additional funding hostage, if anybody has had occasion to study the federal budget lately, you will see that there is a huge deficit. There simply is not any money to fund additional acquisitions for wetlands for national parks, for wildlife refuges, for the other purposes which are detailed in this bill. There simply is no money. The administration has not, during the last eight or ten years, put in any significant money, and it is not going to do it now. And the Congress is not going to do it.

There have been authorizing bills proposed, and you can get plenty of signatures on authorizing bills and everybody says well, look, we are going to get all this money from the land and water conservation fund. It is not going to happen. Anybody knows that who is a serious budgeteer or appropriator around the Congress. It is just not going to happen.

The only way you are going to get that kind of serious money is to tap a fund not now in existence—that is, the ANWR fund. Now, you may call that a bribe if you want to, but I call it the only practical real way to get money for conservation purposes. And the members of the conservation community, I have absolutely no misgivings that they are going to come along and support this bill. I understand they are not. But please understand that the fact that we are going to get some money for some purposes which you may

believe in does not make it a worse bill and please do not savage the bill for that reason, because it is the only place where we are going to get that money.

Now, the State of Alaska, of course, claims it is entitled to 90 percent of the revenues. I hope my dear friends from Alaska will recognize also that the Congress is not going to give them 90 percent of the revenues, as lovely as their personalities are and as sweet as they are, they are just not going to get it, so I hope they will come along with us on 50 percent, which is a lot of money. We did not get 50 percent in Louisiana, but we are giving you more than we got because you are such nice guys. [Laughter.]

My view is that we should distribute the money differently, with 50 percent to the state, 25 percent to the land and water conservation fund, 15 percent for the wetlands and 10 percent to the treasury. I think that is a good distribution, and I hope the administration will feel the same.

My co-author, minority ranking member, Senator McClure.

[The texts of the bill and amendments follow:]

II

101ST CONGRESS
1ST SESSION

S. 406

To authorize competitive oil and gas leasing and development on the Coastal Plain of the Arctic National Wildlife Refuge in a manner consistent with protection of the environment, and for other purposes.

IN THE SENATE OF THE UNITED STATES

FEBRUARY 9 (legislative day, JANUARY 3), 1989

Mr. JOHNSTON (for himself and Mr. MCCLURE) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

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A BILL

To authorize competitive oil and gas leasing and development on the Coastal Plain of the Arctic National Wildlife Refuge in a manner consistent with protection of the environment, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Arctic Coastal Plain Competitive Oil and Gas Leasing Act".

TITLE I—STATEMENT OF PURPOSE AND DEFINITIONS

SEC. 101. PURPOSE AND POLICY.—The Congress hereby declares that it is the purpose and policy of this Act—

(a) to authorize competitive oil and gas leasing and development to proceed on the Coastal Plain in a manner consistent with protection of the environment, maintenance of fish and wildlife and their habitat, and the interests of the area's subsistence users; and

(b) to provide a new source of funding for the Land and Water Conservation Fund, Migratory Bird Conservation Fund and other fish and wildlife management programs, and for the acquisition, protection, creation, and restoration of wetlands, and for other purposes.

SEC. 102. DEFINITIONS.—When used in this Act—

(a) the term "Coastal Plain" means that area identified as such in the map entitled "Arctic National Wildlife Refuge", dated August 1980, as referenced in section 1002(b) of the Alaska National Interest Lands Conservation Act of 1980 (16 U.S.C. 3142(b)(1)) comprising approximately one million five hundred and forty-nine thousand acres; and

(b) the term "Secretary" means the Secretary of the Interior or the Secretary's designee.

TITLE II—COASTAL PLAIN COMPETITIVE LEASING PROGRAM

SEC. 201. LEASING PROGRAM FOR LANDS WITHIN THE COASTAL PLAIN.—(a) The Congress hereby authorizes

and directs the Secretary of the Interior and other appropriate Federal officers and agencies to take such actions as are necessary to establish and implement a competitive oil and gas leasing program that will result in an environmentally sound program for the exploration, development, and production of the oil and gas resources of the Coastal Plain. Activities pursuant to such program shall be undertaken—

(1) in accordance with the development requirements set out in title III of this Act; and

(2) in a manner to ensure the receipt of fair market value by the public for the mineral resources to be leased.

(b) This Act shall be the sole authority for leasing on the Coastal Plain.

SEC. 202. RULES AND REGULATIONS.—(a) The Secretary shall prescribe such rules and regulations as may be necessary to carry out the purposes and provisions of this Act, including rules and regulations relating to protection of the environment of the Coastal Plain, as required by title III of this Act. Such rules and regulations shall be promulgated within nine months after the date of enactment of this Act and shall, as of their effective date, apply to all operations conducted under a lease issued or maintained under the provisions of this Act.

(b) In the formulation and promulgation of rules and regulations under this Act, the Secretary shall request and give due consideration to the views of appropriate officials of the State of Alaska and the Government of Canada. The Secretary shall also consult with the Environmental Protection Agency and the Army Corps of Engineers in developing rules and regulations relating to the environment.

(c) The Secretary shall periodically review and, if appropriate, revise the rules and regulations issued under subsection (a) of this section to reflect any significant biological, environmental, or engineering data which come to the Secretary's attention.

SEC. 203. LEASE SALES.—(a) Lands may be leased pursuant to the provision of this Act to any person qualified to obtain a lease for deposits of oil and gas under the Mineral Leasing Act, as amended (30 U.S.C. 181).

(b) The Secretary shall, by regulation, establish procedures for—

(1) receipt and consideration of sealed nominations for any area in the Coastal Plain for inclusion in, or exclusion from, a lease sale;

(2) public notice of and comment on designation of areas to be included in, or excluded from, a lease sale;

(3) review by the State of Alaska and local governments in Alaska which may be impacted by the proposed leasing; and

(4) periodic consultation with the State of Alaska and local governments in Alaska, oil and gas lessees, and representatives of other individuals or organizations engaged in activity in or on the Coastal Plain including those involved in subsistence uses and recreational activities.

(c) The Secretary shall, by regulation, provide for lease sales of lands on the Coastal Plain. When lease sales are to be held, they shall occur after the nomination process provided for in subsection (b) of this section. For the first lease sale, the Secretary shall, consistent with the requirements set forth in title III of this Act, offer for lease those acres receiving the greatest number of nominations, but not to exceed a total of three hundred thousand acres. If the total acreage nominated is less than three hundred thousand acres, he shall include in such sale any other acreage which he believes has the highest resource potential, but in no event shall more than three hundred thousand acres of the Coastal Plain be offered in such sale. Thereafter, no more than three hundred thousand acres of the Coastal Plain may be leased in any one lease sale. The initial lease sale shall be held within eighteen months of the issuance of final regulations by the Secretary.

The second lease sale shall be held thirty-six months after the initial sale, with additional sales conducted every twenty-four months thereafter so long as sufficient interest in development exists to warrant, in the Secretary's judgment, the conduct of such sales.

(d) Areas of the Coastal Plain deemed by the Secretary to be of particular environmental sensitivity may be excluded from leasing by the Secretary. The Secretary shall notify the Committee on Energy and Natural Resources of the United States Senate and the Committee on Interior and Insular Affairs of the United States House of Representatives ninety days in advance of excluding any such areas from leasing. If the Secretary later determines that exploration, development, or production will result in no significant adverse effect on fish and wildlife, their habitat, and the environment, the Secretary shall, consistent with the provisions of subsection (c) of this section, offer such lands for leasing.

SEC. 204. GRANT OF LEASES BY THE SECRETARY.—(a) The Secretary is authorized to grant to the highest responsible qualified bidder by sealed competitive bid any lands to be leased on the Coastal Plain upon payment by the lessee of such bonus as may be accepted by the Secretary and of such royalty as may be fixed in the lease, which shall be not less than 12½ per centum in amount or value of the production removed or sold from the lease.

(b) The Secretary shall not accept a bid for a lease if the Secretary finds, after notice and hearing, that the bidder is not meeting diligent development requirements on any other Federal mineral lease.

SEC. 205. LEASE TERMS AND CONDITIONS.—An oil and gas lease issued pursuant to this section shall—

(a) be for a tract consisting of a compact area not to exceed two thousand five hundred and sixty acres;

(b) be for an initial period of ten years and as long thereafter as oil or gas is produced in paying quantities or drilling or well reworking operations as approved by the Secretary are operated thereon;

(c) require the payment of royalty as provided for in section 205 of this Act;

(d) require approval of an exploration plan, as provided for in section 207 of this Act;

(e) require approval of a development and production plan, as required in section 207 of this Act;

(f) require posting of bond required by section 208 of this Act;

(g) provide for the suspension of the lease during the initial lease term or thereafter pursuant to section 209 of this Act;

(h) provide for the cancellation of the lease during the initial lease term or thereafter pursuant to section 210 of this Act;

(i) contain the terms and conditions relating to protection of fish and wildlife, their habitat, and the environment, as required by title III of this Act; and

(j) contain such rental and other provisions as the Secretary may prescribe at the time of offering the area for lease.

EXPLORATION AND DEVELOPMENT AND PRODUCTION PLANS

SEC. 206. (a) EXPLORATION PLANS.—All exploration activities pursuant to any lease issued or maintained under this Act shall be conducted in accordance with an approved exploration plan or an approved revision of such plan. Prior to commencing exploration pursuant to any oil and gas lease issued or maintained under this Act, the holder thereof shall submit an exploration plan to the Secretary for approval. Such plan may apply to more than one lease held by a lessee in any region of the Coastal Plain, or by a group of lessees acting under a unitization, pooling, or drilling agreement, and shall be approved by the Secretary if he finds that such plan is consistent with the provisions of this Act and other applicable law.

(b) OIL AND GAS DEVELOPMENT AND PRODUCTION PLANS.—All development and production pursuant to a lease

issued or maintained pursuant to this Act shall be conducted in accordance with an approved development and production plan. Prior to commencing development or production pursuant to any oil and gas lease issued or maintained under this Act, the holder thereof shall submit a development and production plan to the Secretary for approval. Such plan may apply to more than one lease held by a lessee in any region of the Coastal Plain, or by a group of lessees acting under a unitization, pooling, or drilling agreement, and shall be approved by the Secretary if he finds that such plan is consistent with the provisions of this Act and other applicable law.

(c) REQUIREMENTS APPLICABLE TO EXPLORATION PLANS AND DEVELOPMENT AND PRODUCTION PLANS.—Exploration plans and development and production plans shall include where applicable—

(1) the names and legal addresses of the following persons: the operator, contractors, subcontractors, and the owners or lessees other than the operator;

(2) a map or maps showing: (A) the location of a point of reference selected by the operator within the area covered by the plan of operations showing, in relation to that point, existing and proposed access routes or roads within the area, the boundaries of proposed surface disturbance and location of all survey lines; (B) the location of proposed drilling sites, wellsite

layout, and all surface facilities; (C) sources of construction materials within the area including but not limited to gravel; and (D) the location of ancillary facilities including but not limited to camps, sanitary facilities, water supply, disposal facilities, pipelines, fuel storage facilities, storage facilities, base of operations, and airstrips. A point of reference selected by the operator within the area of operations shall be marked with a ground monument;

(3) a description of: (A) all surface and ancillary facilities, including but not limited to camps, sanitary facilities, water supply, disposal facilities, pipelines, fuel storage facilities, storage facilities, base of operations, and airstrips; and (B) the major equipment to be used in the operations, including but not limited to equipment and methods for the transport of all waters used in or produced by operations, and of the proposed method of transporting such equipment within the area covered by the plan of operations including to and from the site;

(4) an estimated schedule for any phase of operations of which review by the Secretary is sought and the anticipated date of operation completion;

(5) the nature and extent of proposed operations;

(6) plans for reclamation, including—

(A) the anticipated reclamation work to be performed;

(B) a proposed schedule of reclamation activities to be performed; and

(C) a detailed estimated of reclamation costs;

(7) methods for disposal of all wastes and hazardous and toxic substances;

(8) an affidavit stating that the operations planned will be in compliance with all applicable Federal, State, and local laws and regulations;

(9) contingency plans in case of spills, leaks, or other accidents; and

(10) such additional information as may be required by the Secretary to ensure that the proposed activities are consistent with this Act, as well as other applicable Federal and State environmental laws.

(d) PROCEDURES FOR PLAN APPROVAL.—(1) After an exploration or development and production plan is submitted for approval, the Secretary shall promptly publish notice of the submission and availability of the text of the proposed plan in the Federal Register and a newpaper of general circulation in the State of Alaska and provide an opportunity for written public comment.

(2) Within one hundred and twenty days after receiving an exploration or development and production plan, the Sec-

retary shall determine, after taking into account any comment received under paragraph (1) of this subsection, whether the activities proposed in the plan are consistent with this Act and other applicable provisions of Federal and State law. If that determination is in the affirmative, the Secretary shall return the plan along with a statement of any modifications necessary for its approval. The Secretary, as a condition of approving any plan under this section—

(A) may require modifications to the plan that he considers necessary or appropriate to make it consistent with this Act and other applicable law. The Secretary shall assess reasonable fees or charges for the reimbursement of all necessary and reasonable research, administrative, monitoring, enforcement, and reporting costs associated with reviewing the plan and monitoring its implementation; and

(B) shall require such periodic reports regarding the carrying out of the drilling and related activities as may be necessary or appropriate for purposes of determining the extent to which the plan is being complied with and the effectiveness of the plan in ensuring that the drilling and related activities are consistent with this Act and other applicable provisions of Federal and State law.

(e) MODIFICATION OF PLANS.—If at any time while activities are being carried out under a plan approved under this section, the Secretary, on the basis of available information, determines that the continuation of any particular activity under the plan is likely to result in a significant adverse effect on fish or wildlife, their habitat, or the environment, the Secretary, after consultation with the lessee shall—

(1) make modifications to part or all of the plan as necessary or appropriate to avoid the significant adverse effect;

(2) temporarily suspend part of all the drilling or related activity under the plan for such time as the Secretary considers necessary or appropriate to avoid such significant adverse effect; or

(3) terminate and cancel the plan where actions under paragraphs (1) or (2) will not avoid the significant adverse effect.

BONDING REQUIREMENTS

SEC. 207. (a) REQUIREMENT FOR PERFORMANCE BOND.—After approval of an exploration or development and production plan, the lessee shall be required to file with the Secretary a suitable performance bond. The bond shall be conditioned upon compliance with all the terms and conditions of the lease and all applicable laws. Such performance bond is in addition to and not in lieu of any bond or security deposit required by other regulatory authorities. The lessee

may file either a surety bond, or a personal bond consisting of cash or negotiable Treasury bonds of the United States. When negotiable Treasury bonds serve as the personal bond, they shall be accompanied by a proper conveyance to the Secretary of full authority to sell such securities in case of a default in the performance of the terms and conditions of the lease.

(b) AMOUNT OF PERFORMANCE BOND.—The performance bond shall be in an amount—

(1) to be determined by the Secretary to provide for reclamation of the lease site in accordance with an approved or revised exploration or development and production plan; plus

(2) an amount set by the Secretary consistent with the type of operations proposed, to provide the means for rapid and effective cleanup, and to minimize damages resulting from an oil spill, the escape of gas, refuse domestic wastewater, hazardous or toxic substances, or fire caused by oil and gas activities. This amount shall not exceed $500,000.00 for geophysical surveys, and shall not exceed a blanket bond of $1,000,000.00 for all exploration activities and an additional $1,500,000.00 for all development and production activities on the Coastal Plain.

(c) ADJUSTMENT OF BOND TO CONFORM TO REVISED PLAN.—In the event that an approved exploration or development and production plan is revised, the Secretary may adjust the amount of the bond to conform to such modified plan.

(d) DURATION OF BOND.—The responsibility and liability of the lessee and its surety under the bond or security deposit shall continue until such time as the Secretary determines that there has been compliance with the terms and conditions of the lease and all applicable law.

(e) TERMINATION OF LIABILITY.—Within sixty days after determining that there has been compliance with the terms and conditions of the lease and all applicable laws, the Secretary shall notify the lessee that the period of liability under the bond or security deposit has been terminated.

SEC. 208. LEASE SUSPENSION.—The Secretary may direct or assent to the suspension of operations and production under any lease granted under the terms of this Act: (1) in the interest of conservation of the resource; (2) where there is not available system to transport the resource; or (3) where there is a threat of significant adverse effect upon fish or wildlife, their habitat or the environment. If such a suspension is directed or assented to by the Secretary, any payment of rental prescribed by such lease shall be suspended during such period of suspension of operations and produc-

tion, and the term of the lease shall be extended by adding any such suspension period thereto.

LEASE CANCELLATION

SEC. 209. (a) CANCELLATION OF NONPRODUCING LEASE.—Whenever the owner of a nonproducing lease fails to comply with any of the provisions of this act, or of any applicable provision of Federal or State environmental law, or of the lease, or of any regulation issued under this Act, such lease may be cancelled by the Secretary if such default continues for the period of thirty days after mailing of notice by registered letter to the lease owner at the lease owner's record post office address.

(b) CANCELLATION OF PRODUCING LEASE.—Whenever the owner of any producing lease fails to comply with any of the provisions of this Act, or of any applicable provision of Federal or State environmental law, or of the lease, or of any regulation issued under this Act, such lease may be forfeited and cancelled by any appropriate proceeding brought by the Secretary in any United States district court having jurisdiction under the provisions of this Act.

(c) ADDITIONAL PROVISIONS.—(1) In addition to the authority for lease cancellation provided for by subsections (a) and (b) of this section, any lease may be canceled at any time, if the Secretary determines, after a hearing, that—

(A) continued activity pursuant to such lease is likely to result in a significant adverse effect to fish or

wildlife, their habitat, or the environment, or is likely to result in serious harm or damage to human life, to property, or to the national security or defense; and

(B) the likelihood of a significant adverse effect will not disappear within a reasonable period of time or the threat of harm or damage will not disappear or decrease to any acceptable extent within a reasonable period of time.

(2) Such cancellation shall not occur unless and until operations under such lease or permit shall have been under suspension, or temporary prohibition, by the Secretary, with due extension of any lease term continuously for a period of five years, or for a lesser period upon request of the lessee.

(3) Cancellation under this subsection shall entitle the lessee to receive such compensation as the lessee demonstrates to the Secretary to be equal to the excess, if any, over the lessee's revenues from the lease (plus interest thereon from the date of receipt to the date of reimbursement) of all consideration paid for the lease and all direct expenditures made by the lessee after the date of issuance of such lease and in connection with exploration or development, or both, pursuant to the lease (plus interest on such consideration and such expenditures from date of payment to date of reimbursement).

SEC. 210. ASSIGNMENT OR SUBLETTING OF LEASES.—No lease issued under the authority of this Act shall be assigned or sublet, except with the consent of the Secretary.

SEC. 211. RELINQUISHMENT.—The lessee may, at the discretion of the Secretary, be permitted at any time to make written relinquishment of all rights under any lease issued pursuant to this Act. The Secretary shall accept the relinquishment by the lessee of any lease issued under this Act where there has not been surface disturbance on the land covered by the lease.

SEC. 212. UNITIZATION.—For the purpose of conserving the natural resources of any oil or gas pool, field, or like area, or any part thereof and in order to avoid the unnecessary duplication of facilities, to protect the environment of the Coastal Plain, and to protect correlative rights, the Secretary shall require to the greatest extent practicable, that lessees unite with each other in collectively adopting and operating under a cooperative or unit plan of development for operation of such pool, field, or like area, or any part thereof.

SEC. 213. OIL AND GAS INFORMATION.—(a)(1) Any lessee or permittee conducting any exploration for, or development or production of, oil or gas pursuant to this Act shall provide the Secretary access to all data and information (including processed, analyzed, and interpreted information) ob-

tained from such activity and shall provide copies of such data and information as the Secretary may request. Such data and information shall be provided in accordance with regulations which the Secretary shall prescribe.

(2) If interpreted information provided pursuant to paragraph (1) of this subsection is provided in good faith by the lessee or permittee, such lessee or permittee shall not be responsible for any consequence of the use or of reliance upon such interpreted information.

(3) Whenever any data or information is provided to the Secretary, pursuant to paragraph (1) of this subsection—

(A) by a lessee or permittee, in the form and manner of processing which is utilized by such lessee or permittee in the normal conduct of business, the Secretary shall pay the reasonable cost of reproducing such data and information; and

(B) by a lessee or permittee, in such other form and manner of processing as the Secretary may request, the Secretary shall pay the reasonable cost of processing and reproducing such data and information.

(b) The Secretary shall prescribe regulations to—

(1) assure that the confidentiality of privileged or proprietary information received by the Secretary under this section will be maintained; and

(2) set forth the time periods and conditions which shall be applicable to the release of such information.

REMEDIES AND PENALTIES

SEC. 214. (a) GENERAL.—Except as provided in section 215 of this Act, the district courts of the United States shall have jurisdiction of cases and controversies arising out of, or in connection with, any lease issued under this Act. Proceedings may be instituted in the judicial district in which any defendant resides or may be found, or in the judicial district in which the Coastal Plain is located.

(b) ACTIONS FOR RELIEF.—At the request of the Secretary, the Attorney General or a United States Attorney shall institute a civil action in the district court of the United States for the district in which any defendant resides or may be found, or in the judicial district in which the Coastal Plain is located, for a temporary restraining order, injunction, or other appropriate remedy to enforce any provision of this Act, any regulation or order issued under this Act, or any term of a lease issued pursuant to this Act.

(c) CIVIL PENALTIES.—If any person fails to comply with any provision of this Act, or any term of a lease issued pursuant to this Act, or any regulation or order issued under this Act, after notice of such failure and expiration of any reasonable period allowed for corrective action, such person shall be liable for a civil penalty of not more than $10,000 for each day of the continuance of such failure. The Secretary

may assess, collect and compromise any such penalty. No penalty shall be assessed until the person charged with a violation has been given an opportunity for a hearing.

(d) CRIMINAL PENALTIES.—Any person who knowingly and willfully: (1) violates any provision of this Act, any term of a lease issued pursuant to this Act, or any regulation or order issued under the authority of this Act designed to protect health, safety, or the environment or conserve natural resources; (2) makes any false statement, representation, or certification in any application, record, report, or other document filed or required to be maintained under this Act; (3) falsifies, tampers with, or renders inaccurate any monitoring device or method of record required to be maintained under this Act; or (4) reveals any data or information required to be kept confidential by this Act, shall, upon conviction, be punished by a fine of not more than $100,000, or by imprisonment for not more than ten years, or both. Each day that a violation under clause (1) of this subsection continues, or each day that any monitoring device or data recorder remains inoperative or inaccurate because of any activity described in clause (3) of this subsection, shall constitute a separate violation.

(e) LIABILITY OF CORPORATE OFFICERS AND AGENTS FOR VIOLATIONS BY CORPORATION.—Whenever a corporation or other entity is subject to prosecution under subsection

(d) of this section, any officer or agent of such corporation or entity who knowingly and willfully authorized, ordered, or carried out the proscribed activity shall be subject to the same fines or imprisonment, or both, as provided for under subsection (d) of this section.

(f) CONCURRENT AND CUMULATIVE NATURE OF PENALTIES.—The remedies and penalties prescribed in this Act shall be concurrent and cumulative and the exercise of one shall not preclude the exercise of the others. Further, the remedies and penalties prescribed in this Act shall be in addition to any other remedies and penalties afforded by any other law or regulation.

(g) REMOVAL COSTS AND LIABILITY FOR DAMAGES.—Notwithstanding any other provision of law, if any area of the Coastal Plain has been or is being polluted by discharges of oil or hazardous or toxic substances from exploration, development, or production of oil or gas or related activities, conducted by, or on behalf of, a responsible party, and if the pollution has damaged or is damaging fish or wildlife, their habitat, or the environment of the Coastal Plain, or if such pollution is causing a substantial threat of damaging those fish or wildlife, their habitat, or the environment of the Coastal Plain, the responsible party shall be jointly, severally, and strictly liable for the removal costs and damages specified in this subsection that arise directly out of or directly

result from pollution that has damaged, or is damaging or is causing substantial threat of damaging fish or wildlife, their habitat, or the environment of the Coastal Plain. The Secretary shall make a determination with respect to such liability after notice to the responsible party and an opportunity for hearing. Upon failure of the responsible party adequately to control and remove the pollutant or threat, the Secretary, in cooperation with other Federal, State, or local agencies, or in cooperation with the responsible party, or both, shall have the right to accomplish the control and removal at the expense of the responsible party. Funds contained in the Coastal Plain Liability and Reclamation Fund, provided for by section 402 of this Act, may be used to accomplish such control and removal until such time as sufficient funds can be recovered from the responsible party. The removal costs and damages referred to in this subsection are the following—

(1) all necessary removal costs as determined by the Secretary;

(2) damages for injury to, destruction of, loss of, and reclamation of natural resources, including the reasonable costs of assessing such injury, destruction, loss, or reclamation; and

(3) damages for economic loss resulting from injury to, or destruction of, real or personal property or

natural resources, and loss of subsistence use of natural resources by local residents.

SEC. 215. EXPEDITED JUDICIAL REVIEW.—Any complaint filed seeking judicial review of an action of the Secretary in promulgating any regulation under this Act may be filed only in the United States Court of Appeals for the District of Columbia, and such complaint shall be filed within ninety days from the date of such promulgation, or after such date if such complaint is based solely on grounds arising after such ninetieth day, in which case the complaint must be filed within ninety days after the complainant knew or reasonably should have known of the grounds for the complaint. Any complaint seeking judicial review of any other actions of the Secretary under this Act may be filed in any appropriate district court of the United States, and such complaint must be filed within ninety days from the date of the action being challenged, or after such date if such complaint is based solely on grounds arising after such ninetieth day, in which case the complaint must be filed within ninety days after the complainant knew or reasonably should have known of the grounds for the complaint.

SEC. 216. ANNUAL REPORT TO CONGRESS.—On March 1 of each year following the date of enactment of this Act, the Secretary of the Interior shall prepare and submit to

the Congress an annual report on the leasing program authorized by this Act.

SEC. 217. PROPERTY INTERESTS OF THE INUPIAT ESKIMO PEOPLE.—The prohibitions and limitations contained in section 1003 of Alaska National Interest Lands Conservation Act of 1980 (16 U.S.C. 3143), insofar as they have application to the subsurface property interests owned by the Inupiat Eskimo people within and adjacent to the Coastal Plain, are repealed. No surface disturbance in support of oil or gas development or production involving such subsurface property interests shall be authorized prior to publication of final regulations issued pursuant to this Act which establish environmental stipulations, terms, and conditions for oil and gas leasing on the Coastal Plain. The substantive provisions of such environmental stipulations, terms, and conditions shall apply to the development of all subsurface property interests owned by the Inupiat Eskimo people within and adjacent to the Coastal Plain.

TITLE III—COASTAL PLAIN DEVELOPMENT REQUIREMENTS

SEC. 301. NO SIGNIFICANT ADVERSE EFFECT STANDARD TO GOVERN AUTHORIZED COASTAL PLAIN ACTIVITIES.—The Secretary shall administer the provisions of this Act through regulations, lease terms, conditions, restrictions, prohibitions, stipulations, and other provisions that ensure the

oil and gas exploration, development, and production activities on the Coastal Plain will result in no significant adverse effect on fish and wildlife, their habitat, and the environment, and that shall require the application of the best commercially available technology for oil and gas exploration, development, and production, on all new exploration, development, and production operations, and whenever practicable, on existing operations.

SEC. 302. SADLEROCHIT SPRING SPECIAL AREA.—(a)(1) The Sadlerochit Spring area, comprising approximately four thousand acres as depicted on the map referenced in section 102 of this Act, is hereby designated to be a Special Area. Such Special Area shall be managed so as to protect and preserve the area's unique and diverse character including its fish, wildlife, and subsistence resource values.

(2) Pursuant to subsection (d) of section 203 of this Act, the Secretary may exclude the Sadlerochit Spring Special Area from leasing.

(3) In the event that the Secretary leases the Sadlerochit Spring Special Area, or any part thereof, for purposes of oil and gas exploration, development, production, and related activities, there shall be no surface occupancy of the lands comprising the Special Area.

(b) The Secretary is authorized to designate other areas of the Coastal Plain as Special Areas if the Secretary deter-

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mines that they are of unique character and interest so as to require such special protection. The Secretary shall notify the Committee on Energy and Natural Resources of the United States Senate and the Committee on Interior and Insular Affairs of the United States House of Representatives of the Secretary's intent to designate such areas ninety days in advance of making such designations. Any such areas designated as Special Areas shall be managed in accordance with the standards set forth in subsection (a) of this section.

SEC. 303. FACILITY CONSOLIDATION PLANNING.—(a) The Secretary shall, after providing for public notice and comment, prepare and update periodically a plan to govern, guide, and direct the siting and construction of facilities for the exploration, development, production, and transportation of Coastal Plain oil and gas resources. This plan shall have the following objectives—

(1) avoiding unnecessary duplication of facilities and activities;

(2) encouraging consolidation of common facilities and activities;

(3) locating or confining facilities and activities to areas which will minimize impact on fish and wildlife, their habitat, and the environment;

(4) utilizing existing facilities wherever practicable; and

(5) enhancing compatibility between wildlife values and development activities.

(b) The plan prepared under this section shall supplement any comprehensive conservation plan prepared pursuant to the requirements of section 304(g) of the Alaska National Interest Lands Conservation Act of 1980 (94 Stat. 2394).

SEC. 304. RIGHTS-OF-WAY ACROSS THE COASTAL PLAIN.—Notwithstanding title XI of the Alaska National Interests Lands Conservation Act of 1980 (16 U.S.C. 3161 et seq.), the Secretary is authorized to grant under section 28 of the Mineral Leasing Act (30 U.S.C. 185) rights-of-way and easements across the Coastal Plain for the transportation of oil and gas under such terms and conditions as may be necessary so as not to result in a significant adverse effect on the fish and wildlife, their habitat, and the environment of the Coastal Plain. Such terms and conditions shall include requirements that facilities be sited or modified so as to avoid unnecessary duplication of roads and pipelines. The comprehensive oil and gas leasing and development regulations issued pursuant to this Act shall include provisions regarding the granting of rights-of-way across the Coastal Plain.

ENFORCEMENT OF REGULATIONS

SEC. 305. (a) RESPONSIBILITY OF THE SECRETARY.—The Secretary shall diligently enforce all regulations, lease

terms, conditions, restrictions, prohibitions, and stipulations promulgated pursuant to this Act.

(b) RESPONSIBILITIES OF HOLDERS OF LEASE.—It shall be the responsibility of any holder of a lease under this Act to—

(1) maintain all operations within such lease area in compliance with regulations intended to protect persons and property on, and fish and wildlife, their habitat, and the environment of, the Coastal Plain; and

(2) allow prompt access at the site of any operations subject to regulation under this Act to any appropriate Federal or State inspector, and to provide such documents and records which are pertinent to occupational or public health, safety, or environmental protection, as may be requested.

(c) ONSITE INSPECTION OF FACILITIES.—The Secretary shall promulgate regulations to provide for—

(1) scheduled onsite inspection by the Secretary, at least twice a year, of each facility on the Coastal Plain which is subject to any environmental or safety regulation promulgated pursuant to this Act or such provisions contained in any lease issued pursuant to this Act to assure compliance with such environmental or safety regulations; and

(2) periodic onsite inspection by the Secretary at least once a year without advance notice to the operator of such facility to assure compliance with all environmental or safety regulations.

TITLE IV—LAND RECLAMATION AND RECLAMATION LIABILITY FUND

SEC. 401. LAND RECLAMATION.—The holder of a lease or leases on lands within the Coastal Plain shall be fully responsible and liable for the reclamation of lands within the Coastal Plain and any other Federal lands adversely affected in connection with exploration, development, or transportation activities on a lease within the Coastal Plain. The holder of a lease shall also be responsible for conducting any land reclamation required as a result of activities conducted on the lease by any of the lease holder's subcontractors or agents. The holder of a lease may not delegate or convey, by contract or otherwise, this responsibility and liability to another party without the express written approval of the Secretary.

SEC. 402. STANDARD TO GOVERN LAND RECLAMATION.—The standard to govern the reclamation of lands required to be reclaimed under this Act, following their temporary disturbance or upon the conclusion of their use or prolonged commercial production of oil and gas and related activities, shall be reclamation and restoration to a condition as closely approximating the original condition of such lands as

is feasible using the best commercially-available technology. Reclamation of lands shall be conducted in a manner that will not itself impair or cause significant adverse effects on fish or wildlife, their habitat, or the environment.

SEC. 403. COASTAL PLAIN LIABILITY AND RECLAMATION FUND.—(a) Within six months of a commercial discovery within the Coastal Plain, the Coastal Plain Liability and Reclamation Fund (the "Reclamation Fund") is hereby directed to be established as a non-profit corporate entity under the laws of Alaska that may sue and be sued in its own name. The Reclamation Fund shall be established and administered by the holder of the trans-Alaska pipeline right-of-way under regulations prescribed by the Secretary. The Reclamation Fund shall be subject to an annual audit by the Comptroller General, and a copy of the audit shall be submitted to the Congress.

(b) The operator of the trans-Alaska pipeline shall collect from the owner of any commercially-produced crude oil or natural gas liquids from the Coastal Plain at the time and point where such crude oil first enters the trans-Alaska pipeline a fee of five cents per barrel. The collection of the fee shall cease when $50,000,000 has been accumulated in the Reclamation Fund, and it shall be resumed at any time that the accumulation of revenue in the Reclamation Fund falls below $45,000,000.

(c) All revenues collected under subsection (b) shall be paid into the Reclamation Fund. The reasonable costs of administration of the Reclamation Fund shall be paid from the revenues in the Reclamation Fund. All sums not needed for administration of the Reclamation Fund or making authorized payments out of the Fund shall be invested prudently in income-producing securities approved by the Secretary. Income from such securities shall be added to the principal of the Reclamation Fund.

(d) The revenues in the Reclamation Fund shall be available, with the approval of the Secretary, for the following purposes—

(1) to compensate promptly any person or entity, public or private, for any damages caused by oil and gas exploration, development and production activities on or in the vicinity of the Coastal Plain;

(2) to reclaim any area of the Coastal Plain not reclaimed in accordance with the standard set forth in section 402 of this Act, by the operator or the holder of a lease or leases;

(3) up to $5,000,000 annually to reclaim and restore any area of the Arctic National Wildlife Refuge or other North Slope Federal lands previously disturbed by development activities and not properly re-

claimed and restored by the party conducting the development;

(4) up to $2,000,000 annually to the Director of the Fish and Wildlife Service to monitor and conduct research on fish and wildlife species which utilize the land and water resources of the Coastal Plain; and

(5) to reclaim at the conclusion of the period of exploration, development and production, any area of the Coastal Plain and related lands which have not been properly reclaimed by the operator or lease holder.

(e) The United States shall have legal recourse against any party or entity who is responsible for the reclamation of any area within the Coastal Plain, to recover any funds expended under paragraphs (1), (2), (3) and (5) of this subsection due to a failure by the responsible party to reclaim such area as required by this Act: *Provided*, That such right of recovery shall not be available against any Alaska Natives conducting traditional subsistence use activities. Any funds so recovered shall be deposited in the Reclamation Fund.

(f) Any moneys remaining in the Reclamation Fund fifty years after the period of active oil and gas exploration, development, production and reclamation has been concluded in the Coastal Plain shall be paid into the Migratory Bird Conservation Fund.

TITLE V—DISPOSITION OF OIL AND GAS REVENUES

SEC. 501. DISTRIBUTION OF REVENUES.—Notwithstanding any other provision of law, all revenues received from competitive bids, sales, bonuses, royalties, rents, fees, interest charges or other income derived from the leasing of oil and gas resources within the Arctic National Refuge, Alaska shall be distributed as follows:

(a) 50 per centum to the State of Alaska;

(b) 25 per centum deposited into the Land and Water Conservation Fund;

(c) 15 per centum to the Secretary to be used, under such terms and conditions as the Secretary may prescribe, for the acquisition, protection, creation, and restoration of wetlands in the United States; and

(d) 10 per centum to miscellaneous receipts in the Treasury.

SEC. 502. LAND AND WATER CONSERVATION FUND.—(a)(1) Moneys deposited into the Land and Water Conservation Fund ("the Fund") pursuant to section 501 shall be credited to a special account within the Fund. In addition, beginning the first full fiscal year after funds are credited to the special account, there shall also be credited to the special account an amount equal to the average annual appropriation from the Fund for the five years preceding the

date of the initial crediting of funds pursuant to section 501(b). These funds shall be derived from those moneys comprising the authorized but unappropriated balance of the Fund.

(2) Not more than 25 per centum of the funds deposited into the special account shall be available for State purposes pursuant to section 6 of the Land and Water Conservation Fund Act (16 U.S.C. 460l–8). The balance of the funds in the special account shall be available, without further appropriation, for Federal purposes as provided in section 7 of that Act (16 U.S.C. 460l–9) and shall be allocated in accordance with this section.

(b)(1) At the time of the submission of the President's budget, each Federal land managing agency eligible to receive moneys from the Fund shall provide the Committee on Appropriations of the United States House of Representatives and the United States Senate with a list, in descending order of priority, of land acquisition projects which have been authorized by law (hereinafter in this section referred to as the "priority list").

(2) The priority lists shall be prepared by the Directors of the Bureau of Land Management, National Park Service, Fish and Wildlife Service, Department of the Interior, and the Chief of the Forest Service, United States Department of Agriculture, and shall reflect their best professional judgment

regarding the land acquisition priorities of such bureau or agency.

(3) In preparing such lists the following factors shall be considered: the amount of money anticipated to be made available in any one year; the availability of land appraisal and other information necessary to complete the acquisition in a timely manner; the potential adverse impacts on the park, wilderness, wildlife refuge or other such unit which might result if the acquisition is not undertaken; and such other factors as the land managers deem appropriate.

(c)(1) The Appropriations Committees shall allocate the funds from the special account in accordance with the priority lists submitted pursuant to this section unless such lists are specifically modified in appropriations Acts or reports accompanying such Acts.

(2) The Secretary of the Treasury shall notify the Appropriations Committees of the Congress on an annual basis as to the amounts available for allocation within the special account.

(3) In allocating funds from the special account among land managing agencies, the Appropriations Committee shall ensure that each agency receives a fair and equitable share in accordance with land acquisition needs, congressional directives, and historical patterns of distribution of the fund: *Provided,* That no agency shall receive more than 50 per centum

of the funds available from the special account in any one year.

(d) In the event that the Appropriations Committees fail to allocate the funds from the special account, the Secretary of the Treasury is authorized and directed to make such funds directly available to the land managing agencies to be used solely for land acquisition projects on the respective priority lists in accordance with the following formula:

(1) 45 per centum to the Fish and Wildlife Service;

(2) 40 per centum to the National Park Service;

(3) 10 per centum to the Forest Service; and

(4) 5 per centum to the Bureau of Land Management.

SEC. 503. JUDICIAL REVIEW AND NON-SEVERABILITY.—(a) Notwithstanding the provisions of section 215 of this Act, any legal action, including an action for declaratory judgment, to challenge the determination made in section 501(a) of this Act of the State of Alaska's share of oil and gas revenues shall be assigned for hearing and completed at the earliest possible date, shall, to the greatest extent practicable, take precedence over all other matters pending on the docket of the court at that time, and shall be expedited in every way by such court. Any such action shall be brought within ninety days of enactment of this Act in an appropriate

United States district court. Such action shall be barred unless a complaint is filed within the time specified. Any review of an interlocutory or final judgment, decree, or order of the United States district court in such action may be had only upon direct appeal to the Supreme Court of the United States.

(b) Nothing in this section shall be construed to grant causes of action to any person or to waive any defenses which may be available to the United States.

(c) If any action is brought in accordance with subsection (a), no lease sale shall occur under section 203 of this Act until a final nonappealable decision has been issued in any such action.

(d) If the revenue sharing provision of section 501(a) of this Act is held invalid, the remainder of this Act shall be void.

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AMENDMENT NO. 3

Purpose: .....

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IN THE SENATE OF THE UNITED STATES—101st Cong., 1st Sess.

S. 406

To authorize competitive oil and gas leasing and development on the Coastal Plain of the Arctic National Wildlife Refuge in a manner consistent with protection of the environment, and for other purposes.

February 9 (legislative day, January 3), 1989

Referred to the Committee on Energy and Natural Resources and ordered to be printed

AMENDMENT intended to be proposed by Mr. JOHNSTON (for himself and Mr. MCCLURE)

Viz: S. 406 is amended by inserting after title I the following new title, renumbering the remaining titles and sections as appropriate and making all necessary conforming changes:

TITLE II. CONGRESSIONAL DETERMINATION OF COMPATIBILITY

SEC. 201. CONGRESSIONAL DETERMINATION.—Congress hereby determines that oil and gas activities authorized and conducted on the Coastal Plain pursuant to this Act so as to result in no significant adverse effect on fish and wildlife, their habitat, and the environment, shall be deemed to be compatible with the major purposes for which the Arctic National Wildlife Refuge was established and no further findings

or determinations of compatibility by the Secretary under the National Wildlife Refuge System Administration Act are required to implement this congressional determination.

AMENDMENT NO. 4

Purpose: .....

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IN THE SENATE OF THE UNITED STATES—101st Cong., 1st Sess.

February 9 (legislative day, January 3), 1989

S. 406

To authorize competitive oil and gas leasing and development on the Coastal Plain of the Arctic National Wildlife Refuge in a manner consistent with protection of the environment, and for other purposes.

Referred to the Committee on Energy and Natural Resources and ordered to be printed

AMENDMENT intended to be proposed by Mr. JOHNSTON (for himself and Mr. MCCLURE).

Viz: S. 406 is amended by inserting after section 202 the following new section 203, renumbering the remaining sections as appropriate, and making all necessary conforming changes:

SEC. 203. ADEQUACY OF DEPARTMENT OF THE INTERIOR'S LEGISLATIVE ENVIRONMENTAL IMPACT STATEMENT.—(a) The "Final Legislative Environmental Impact Statement" (April 1987).on the Coastal Plain prepared pursuant to section 1002 of the Alaska National Interest Lands Conservation Act of 1980 (16 U.S.C. Sec. 3142), and section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. Sec. 4332(2)(C)), is hereby found by the Congress

to be adequate to satisfy the legal requirements under the National Environmental Policy Act of 1969 with respect to actions authorized to be taken by the Secretary to develop and promulgate the regulations for the establishment of a leasing program authorized by this Act prior to conducting the first lease sale.

(b) Except as provided in subsection (a) of this section, nothing in this Act shall be considered or construed as otherwise limiting or affecting in any way the applicability of section 102(2)(C) of the National Environmental Policy Act of 1969 to all phases of oil and gas leasing, exploration, development and production and related activities conducted under or associated with the leasing program authorized by this Act, nor shall anything in this Act be considered or construed as in any way limiting or affecting the applicability of any other Federal or State law relating to the protection of the environment.

AMENDMENT NO. 5

Purpose: .....

.....

IN THE SENATE OF THE UNITED STATES—101st Cong., 1st Sess.

February 9 (legislative day, January 3), 1989

S. 406

To authorize competitive oil and gas leasing and development on the Coastal Plain of the Arctic National Wildlife Refuge in a manner consistent with protection of the environment, and for other purposes.

Referred to the Committee on Energy and Natural Resources and ordered to be printed

Amendment intended to be proposed by Mr. JOHNSTON (for himself and Mr. MCCLURE)

Viz:

S. 406 is amended by—

(1) redesignating title III as "Coastal Plain Environmental Protection";

(2) redesignating existing section 301 as section 301(a) and adding a new subsection (b) thereafter as follows:

"(b) SITE-SPECIFIC ASSESSMENT AND MITIGATION.—The Secretary shall also require, with respect to any proposed drilling and related activities, that—

"(1) a site-specific analysis be made of the probable effects, if any, that the drilling or related activities will have on fish and wildlife, their habitat, and the environment; and

"(2) a mitigation plan be implemented to avoid, minimize or compensate for any adverse effect assessed under paragraph (1) of this subsection.";

(3) inserting after section 301 the following new section 302 and renumbering the remaining sections as appropriate:

"SEC. 302. REGULATIONS TO PROTECT THE COASTAL PLAIN'S FISH AND WILDLIFE RESOURCES, SUBSISTENCE USERS AND THE ENVIRONMENT.—(a) Prior to implementing the leasing program authorized by title II of this Act, the Secretary shall prepare and promulgate regulations, lease terms, conditions, restrictions, prohibitions, stipulations, and other measures designated to ensure that the activities undertaken in the Coastal Plain authorized by this Act are conducted in a manner consistent with the purposes and environmental requirements of this Act.

"(b) The proposed regulations, lease terms, conditions, restrictions, prohibitions, and stipulations for the leasing program authorized by title II of this Act shall require compliance with all applicable provisions of Federal and State environmental law and shall also require—

"(1) as a minimum, the safety and environmental mitigation measures set forth in items one through twenty-nine (1 through 29) at pages 167 through 169 of the "Final Legislative Environmental Impact Statement" (April 1987) on the Coastal Plain;

"(2) seasonal limitations on exploration, development and related activities, where necessary, to avoid significant adverse effects during periods of concentrated fish and wildlife breeding, denning, nesting, spawning and migration;

"(3) that exploration activities, except for surface geological studies, be limited to the period between approximately November 1 and May 1 and that exploration activities will be supported by ice roads, winter trails with adequate snow cover, ice pads, ice airstrips, and air transport methods: *Provided*, That such exploration activities may be permitted at other times if the Secretary determines, after affording an opportunity for public comment and review, that special circumstances exist necessitating that exploration activities be conducted at other times of the year and he finds that such exploration will have no significant adverse effect on the fish and wildlife, their habitat, and the environment of the Coastal Plain;

"(4) design safety and construction standards for all pipelines and any access and service roads that—

"(A) minimize adverse effects upon the passage of migratory species such as caribou to the maximum extent possible; and

"(B) minimize adverse effects upon the flow of surface water by requiring the use of culverts, bridges and other structural devices;

"(5) prohibitions on public access and use on all pipeline access and service roads;

"(6) stringent reclamation and rehabilitation requirements, consistent with the standards set forth in this Act, requiring the removal from the Coastal Plain of all oil and gas development and production facilities, structures and equipment upon completion of oil and gas production operations: *Provided,* That the Secretary may exempt from the requirements of this paragraph those facilities, structures or equipment which the Secretary determines would assist in the management of the Arctic National Wildlife Refuge and which are donated to the United States for that purpose;

"(7) appropriate prohibitions or restrictions on access by all modes of transportation;

"(8) appropriate prohibitions or restrictions on sand and gravel extraction;

"(9) consolidation of facility siting;

"(10) appropriate prohibitions or restrictions on use of explosives;

"(11) avoidance, to the extent practicable, of springs, streams and river system; the protection of natural surface drainage patterns, wetlands, and riparian habitats; and the regulation of methods or techniques for developing or transporting adequate supplies of water for exploratory drilling;

"(12) avoidance or reduction of air traffic-related disturbance to fish and wildlife;

"(13) treatment and disposal of hazardous and toxic wastes, solid wastes, reserve pit fluids, drilling muds and cuttings, and domestic wastewater, in accordance with applicable Federal and State environmental law;

"(14) fuel storage and oil spill contingency planning;

"(15) research, monitoring and reporting requirements;

"(16) field crew environmental briefings;

"(17) avoidance of significant adverse effects upon subsistence hunting, fishing, and trapping by subsistence users;

"(18) compliance with applicable air and water quality standards;

"(19) appropriate seasonal and safety zone designations around well sites within which subsistence hunting and trapping would be limited;

"(20) reasonable stipulations for protection of cultural and archeological resources; and

"(21) all other protective environmental stipulations, restrictions, terms, and conditions deemed necessary by the Secretary.

"(c) In preparing and promulgating regulations, lease terms, conditions, restrictions, prohibitions, and stipulations under this section, the Secretary shall consider—

"(1) the environmental protection standards which governed the initial Coastal Plain seismic exploration program (50 Code of Federal Regulations 37.31–33);

"(2) the land use stipulations for exploratory drilling on the KIC–ASRC private lands which are set forth in appendix 2 of the August 9, 1983, agreement between Arctic Slope Regional Corporation and the United States; and

"(3) the operational stipulations for Koniag ANWR Interest lands contained in the draft Agreement between Koniag, Inc. and the United States of

America on file with the Secretary of the Interior on December 1, 1987.";

(4) inserting after section 304 the following new section 305 and renumbering the remaining sections as appropriate:

"SEC. 305. ENVIRONMENTAL STUDIES.—In addition to any other environmental studies required by law, subsequent to exploring or developing of any area or region of the Coastal Plain, the Secretary shall conduct such additional studies to establish environmental information as he deems necessary, and shall monitor the human, marine, and coastal environments of such area or region in a manner designed to provide information which can be used for comparison with any previously collected data for the purpose of identifying any effects on fish or wildlife and their habitat and any significant changes in the quality and productivity of such environments, for establishing trends in the areas studied and monitored, and for designing experiments to identify the causes of such effects or changes."; and

(5) making all necessary conforming changes.

STATEMENT OF HON. JAMES A. McCLURE, U.S. SENATOR FROM IDAHO

Senator McCLURE. Thank you very much, Mr. Chairman. I will be very brief, but I do want to make a statement. I look forward to working with you and realizing a responsible solution to the development of the Arctic National Wildlife Refuge, and I appreciate this hearing.

I believe the national interest requires both the conservation of wildlife resources and rare and pristine natural environments and the development of domestic energy supplies.

The coastal plain and the Arctic National Wildlife Refuge is considered by the oil industry to be the most promising unexplored area in the United States for discovering super giant oil fields.

The refuge is considered by environmentalists to possess outstanding wilderness values and to be an especially important habitat for caribou, bears, musk ox and migrating birds. And we far too often forget or ignore the interest and the rights of the native peoples of the area. We are never to forget the interest of the people of Alaska, and I am sure we will be reminded of that throughout these proceedings.

I believe it is important to keep in mind that current law and practice does permit oil and gas exploration in other wildlife refuges across the country. These refuges currently provide environmentally sound management of the natural resources as well as encourage industrial development where appropriate.

I know that many here have been genuinely concerned over issues such as the coastal plain environment, maintenance of caribou populations and wildlife habitat. I share those same concerns, but I truly believe we can open ANWR.

And if it is done in accordance with the legislation before us, we can still protect the caribou, protect their calving grounds, protect the clean air and clean water. We need to put to use the knowledge we already have about the effects of development and position ourselves to develop the Arctic National Wildlife Refuge in a responsible, deliberate and environmentally sound manner.

In addition to the conservation of existing energy resources and development of alternative fuels, exploration and development of energy resources is essential for growth as a nation and for our economic survival in this world. There is no question in my mind of the importance of opening ANWR for our energy needs just as there is no doubt that we truly can accomplish this in an acceptable and sound environmental manner. Thank you, Mr. Chairman.

The CHAIRMAN. If there are no other opening statements——

Senator WIRTH. Mr. Chairman.

The CHAIRMAN. Yes, Senator Wirth?

Senator WIRTH. I am sure there are others of us who would like to comment on this issue, Mr. Chairman.

The CHAIRMAN. Senator Wirth.

STATEMENT OF HON. TIMOTHY E. WIRTH, U.S. SENATOR FROM COLORADO

Senator WIRTH. Thank you very much, Mr. Chairman. It seems to me that we are watching a train start to come down the track,

and it is probably one of the most ill-fueled and ill-directed trains that I have seen in some time.

Here we have an administration coming in, claiming that it is going to follow a new set of environmental standards for the administration and saying that we ought to go up and drill ANWR, and this is the same administration that has said that what it wants to do is to lower the mile per gallon standards for automobiles. This, at a time when we are concerned about global warming, we are concerned about the whole series of environmental issues, carbon dioxide being one of the major problems we face.

And essentially what we are going to be doing here, Mr. Chairman, is drilling in ANWR for the purposes of fueling a lot of gas guzzling automobiles in the United States. It seems to me that that is a very short-sighted and ultimately bankrupt energy policy.

From my perspective, we may end up having to drill ANWR. We may end up deciding that that is something that ought to be done, but it seems to me, as we argued last year and the year before, that this ought to be done in the overall context of some national sensible policy toward energy overall.

I do not think that there is any petroleum geologist in the United States who would argue that in the battle for energy self-sufficiency and energy independence that we in the United States are going to be able to produce ourselves out of the situation. We are simply not going to be able to do that.

What we are going to have to do is to develop alternatives. What we are going to have to do is to look at energy conservation and to allow ourselves to go trundling down this particular road in ANWR with absolutely no idea how this relates to anything else that we may be doing, it seems to me, misses a huge opportunity, and that is the opportunity for this administration coming in de novo to act in a sensible, rational and thoughtful way and look at the overall pattern of energy, energy use, and energy features in the United States, and that simply has not been done.

Beyond the energy policy, it seems to me, there are a whole series of environmental canards that have been set up by those who would like to open up ANWR saying that, you know, more caribou are there because you have a nice and fuzzy warm pipeline against which the caribou can nuzzle and that produces more caribou and is it not wonderful.

You know, we know that simply is not the case. Unfortunately is way out of the way for most people in the United States, and they do not know where it is. They think it is so far out in the wilderness, isolated, that it really does not make any difference.

I would suspect most people in this country would not suggest that we drill in Yellowstone or Yosemite or Rocky Mountain National Park or anything like that, but in this last extraordinary refuge we are about to embark upon a drilling campaign with the arguments being made that there is no environmental damage.

Well, we know that during the development of the last administration's approach to ANWR, a whole series of reports were buried, never showed up, never were destroyed, never put on the record, and despite the fact that this Congress has asked for them, for example, the fish and wildlife report requested by the House Interior Committee, that has not been forthcoming. And now we see most

recently a major report coming out of the EPA which, it seems to me is pretty damaging, about the environmental impacts of drilling on the North Slope.

Now, we may decide to go ahead and drill anyway, but it seems to me we certainly have an obligation to look at all of the data that is available. We do not have, Mr. Chairman, to go ahead and request another study. There are all kinds of studies available. Well, why do we not have them? Where are they? Who has looked at them? It seems to me that that is data that we ought to have, and I will ask Secretary Lujan to see if he can make that available to us for the record.

This is an enormous decision, Mr. Chairman. Unfortunately in this whole decision, as you know, the line has been drawn in the sand. Most of the domestic environmental groups have made ANWR the number one issue in coming up, and I think Secretary Lujan regrets this, too, that this has become the kind of an enormous battle, Mr. Secretary.

I wish we could figure a way through this. It does not look to me with this train coming down the track and we are going to be able to do anything kind of a rational job, and I regret that.

Finally I would hope, Mr. Secretary, that we are going to be able to get from all of you the kind of review that apparently you have given to other previous—other decisions made by the previous administration.

As I understand it, the previous administration decided to drill off the California coast and off the Florida coast and you all decided not to do that. I would be interested to know how you made a decision and review not to drill off the coast of Florida or the coast of California, but you decided to continue with the previous administration's position of drilling on the North Slope.

What is the rationale for making—for doing it one place and not doing it with another?

I would assume that you had a team of people on board in the new administration to allow you to do that kind of analysis, and I look forward to hearing your explanation for how you decided to do one and not the other.

Mr. Chairman, I appreciate the opportunity to make an opening statement. I would suggest to you that I think we are going to be here for a good long period of time this March and April thinking about this issue, and not only here but in other committees and so on. It is not one that lends itself to easy answers, as you know, but as we try to get answers to the difficult questions, let us be rational and careful about it and not throw ourselves in front of a new misguided train.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, Senator Wirth. If there are no further opening statements——

Senator MURKOWSKI. Mr. Chairman.

The CHAIRMAN. Yes, for a very brief opening statement, because we have a long list of witnesses. Senator Murkowski.

STATEMENT OF HON. FRANK H. MURKOWSKI, U.S. SENATOR FROM ALASKA

Senator MURKOWSKI. I understand and I appreciate your acknowledgment of me.

I think this is the 10th hearing this committee has held on the subject. As such, I do not expect to learn much that has not already been said.

The only changes from last year concern the need to pass this legislation, and I think as the Chairman has noted, and some others have highlighted the past 2 months, our domestic production of crude oil has been below 50 percent of consumption. We are importing more than we are producing.

In addition, the outlook is dim for any significant new exploration of our outer continental oil and gas prospects. These facts, certainly tell me it is time to authorize environmentally sensitive oil and gas leasing in the coastal plain of ANWR. It is certainly the most promising unexplored oil and gas prospect in North America.

If we were to recall the President's State of the Union Address, he said he felt we should go ahead with ANWR, that we could do it in compatibility with the environment and the ecology and in the same breath he withdrew two lease sales in California and one in Florida.

What the President said in effect, Mr. Chairman, is if you can initiate OCS drilling in Alaska, you cannot do it anywhere in the United States. In that regard, Mr. Chairman, I wholeheartedly support your intention to begin marking up this legislation on Wednesday. The sooner we enact leasing legislation, the sooner we can seriously address our energy security.

I would only comment, Mr. Chairman, that I will be introducing an amendment, as you might suspect, on the revenue sharing from 50–50 to 90–10. I do agree with your contention that a 50 percent of something is better than 100 percent of nothing.

In conclusion, Mr. Chairman, I would be remiss if I did not comment on the New York Times story. It is a rather interesting one, and the timeliness of it, I think, bears some examination.

It is an unpublished report that supposedly details environmental damage from oil production on Alaska's North Slope. I have not seen this report, Mr. Chairman. I doubt if anyone in this room with perhaps one or two representatives of the environmental groups have seen it.

Last May we had a similar event. The House Interior Committee was getting ready to mark up ANWR, and what came out was a sensational leak, a leak by the same reporter in the same newspaper, an exclusive Fish and Wildlife Service report which only the environmental organizations had seen and which was leaked only to the New York Times reporter.

Do you remember what happened to that story last year? It died. It died because of lack of credibility. No other reporter or newspaper used it because they got the report in a manner that was clearly evident that it was used out of context. The sensationalism was unfounded, the reporter was embarrassed, and the story disappeared. And I believe the sensational story this time will suffer the same end.

I would draw the committee's attention to the Office of Technology's Assessment Report issued last Friday. The OTA concluded that the Arctic oil field technology currently used at Endicott and Kuparuk are the likely technologies to be used in ANWR.

It is interesting to note, and a lot of people do not recognize this, Mr. Chairman, but we brought on Endicott a year ago last February. It has been in existence just one year as the tenth largest producing field. Now it is the ninth largest producing field, about 100,000 barrels a day, and it utilizes just 55 surface acres. That is the footprint. The estimated footprint of ANWR is 12,500 acres, and for those environmentalists who do not understand what that is, it is approximately the size of Dulles International Airport complex.

Mr. Chairman, the oil industry has been operating in the Arctic for over 30 years. During that time they have made some mistakes. No one is perfect by any means, but more importantly, during those 30 years we have learned a lot. We have put the knowledge to use, and Endicott demonstrates that knowledge.

I have no doubt that when we actually see this EPA report we will find that the incidents cited in yesterday's story are taken completely out of context. They do not take into account the improvement in technology and the fact that Prudhoe Bay has produced over six billion barrels of oil in the last 12 years.

Could it be that once again the sensational story is a staged event? The environmental lobby with their exclusive leaked stories to the New York Times reporter appears to be attempting to skew the process through the press. It is an obvious attempt to influence the decision of this committee, Mr. Chairman, an indication that they cannot prevail on their own merits, so they must attempt to redraw the process. It is something that I do not intend to see happen, and I ask each member of this committee and the Congress, for that matter, to learn the facts about the environmental record of oil development of Alaska's North Slope, and I will be personally willing to take anybody up there at any time and go out and see if we can find the things that the New York Times alleges are there. They are not there, Mr. Chairman.

Thank you.

The CHAIRMAN. Senator Burns?

Senator BURNS. Mr. Chairman, I have an opening statement, but Mr. Chairman, in the interest of time I will submit it, so that it can be part of the record.

[The prepared statement of Senator Burns follows:]

FINAL

COMMITTEE ON ENERGY AND NATURAL RESOURCES

HEARING on S.406 ARCTIC NATIONAL WILDLIFE REFUGE

by SENATOR CONRAD BURNS

Mr. Chairman, we are continuing the years of past ANWR deliberations trying to balance our needs for a solution to our declining sources of oil and gas, protection for a wonderful wildlife sanctuary, and the economic vitality of Alaskan natives on the north slope. The process will not be easy but we must forge ahead to resolve this matter as quickly as possible.

I want to say out front that I am concerned about our increasing dependence on foreign oil supplies. We recently passed the point where our imports are exceeding domestic production--for the first time in history. The future doesn't look any better as oil imports are projected at 62 percent of our total needs by the year 2010. Any disruption in supply would cause severe economic damage to every citizen as well as severely threatening our national security. We cannot take this situation lightly.

At the same time I want to recognize the importance of the Refuge to fish and wildlife resources. Even those favoring the development can appreciate the huge Porcupine caribou herd, the grizzly and polar bears, the wolves, muskoxen, moose, the significant number and variety of birds and waterfowl and the whales and seals who live offshore in the Beaufort Sea. These

wildlife deserve our concern and protection as we remove the oil and gas.

And we can't forget the native Inupiat Eskimo people -- their needs and their rights. The developments at Prudhoe brought the natives many of the advantages of modern technology like medical treatment, schooling and television, things they don't want to lose when the oil and gas is gone. The Federal government saw fit to acquire native lands in the Gates of the Arctic National Park in exchange for the subsurface rights to their land around Kaktovik. The native mineral rights cannot be exercised without Congressional action.

The Department of Interior estimates that there is a 19 percent chance of finding economically recoverable oil under the Refuge Coastal Plain. This 1 in 5 chance compares with 1 in 50 in the lower 48 states. There are estimates of 5 to 30 billion barrels of oil. These estimates should make the leases quite valuable.

If we can agree to development now, it would be at least ten years before any production begins. This is not a short term solution to our increasing oil supply problem, but it can be a help in the next century. Let us not forget that the cost of arctic development is very high due to the remoteness and the harsh climate, and the cost will continue to rise every year we wait.

According to S.406, leasing and development in the Refuge would proceed only under adequate environmental stipulations to ensure no significant adverse effect on fish and wildlife, their habitat and the environment in general. The more recent development at the Endicott oil field near Prudhoe demonstrates that technology gains are now available to minimize the effects on the local environment. The wildlife in Prudhoe have not been significantly impacted. This fact comes from professional biologists. Some CONSERVATIONIST ~~environmentalists~~ say the development ran off the wolves, but the biologists tell me wolves were not indigenous to the coast around Prudhoe anyway. Caribou populations have increased all across the Arctic, including in the Prudhoe coastal plain.

Lastly, S.406 would allow the Inupiat Eskimo lands to develop their subsurface rights under the same regulations that apply to the remainder of the leases under this bill. This is an appropriate action.

I look forward to the witnesses statements. I want to make final judgment based on the best information available at this time.

Thank you Mr. Chairman for the opportunity to make these remarks.

The CHAIRMAN. Thank you, Senator Burns.

For his maiden performance before this committee as Secretary of the Interior, we are very pleased to have Secretary Manuel Lujan.

STATEMENT OF HON. MANUEL LUJAN, JR., SECRETARY, DEPARTMENT OF THE INTERIOR, ACCOMPANIED BY JIM CASON, ACTING ASSISTANT SECRETARY FOR LAND AND MINERALS MANAGEMENT; AND SUSAN LAMSON, DEPUTY ASSISTANT SECRETARY FOR FISH, WILDLIFE AND PARKS

Secretary LUJAN. Thank you very much, Mr. Chairman. It is a pleasure to appear before you today to discuss one of the most important energy and environmental goals of the Bush Administration, and that is the prudent and environmentally sound development of the coastal plain of the Arctic National Wildlife Refuge.

Mr. Chairman, before proceeding, let me introduce to you some people that will help me out today, when you have some pretty tough questions.

Jim Cason is acting assistant secretary for Land and Minerals Management, and Susan Lamson is Deputy Assistant Secretary for Fish, Wildlife and Parks. And so, when the going gets a little tough, I will just turn to them, Mr. Chairman.

Mr. Chairman, the administration stands together in its support for this goal. We appreciate this committee's expeditious consideration. We are convinced that our natural resources can be sensibly developed without causing harm to our environment.

The goal of the Administration is to recognize both the fish and wildlife and the energy values of the coastal plain, and to assist the Congress in fashioning legislation that will provide the American people with an opportunity to benefit from the various potential areas 'mineral worth while protecting fish and wildlife qualities as well.

The legislation we are looking at today is a positive step toward that goal. And while we have some concerns with some provisions of S. 406, I believe that this legislation provides appropriate guidelines and safeguards, and can play an important role in this nation's energy policy.

Mr. Chairman, my concerns with S. 406 are as follows.

Title 5 sets out the distribution formula for revenues from oil and gas activities in ANWR. I note that only 10 percent of the ANWR revenues would be deposited in the general treasury, and you have addressed this issue, Mr. Chairman.

You and the members of this committee are well aware of the current budget crisis that this nation faces. This Administration has already recognized the need for more land acquisition and increased wetlands protection, but these priorities, Mr. Chairman, must take their place among other fiscal needs.

The budget process is the most appropriate means that we have for weighing our social, environmental, defense and international needs against each other. No significant adverse effect—Mr. Chairman, this environmental standard in S. 406 is undefined. Without a clear definition, exploration, development and production in ANWR could virtually be halted.

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At a minimum, we can be certain that extensive litigation would result, and the Federal courts would be left to interpret the Congress' intent.

In phased leasing, Mr. Chairman, the restriction to only 20 percent of the coastal plain for the first lease-sale, 300,000 acres, is excessively burdensome. I believe that the amount of land offered at any sale should be decided by the Secretary, because limited offerings could make it difficult to achieve a planned consolidation of facilities and to minimize the environmental impacts of an area.

The best commercially available technology provision is unnecessary. Mandating technology does not always ensure an environmental result. My staff has identified other technical concerns with S. 406, and would appreciate the opportunity to review them with the Committee staff.

Mr. Chairman, I congratulate the committee on having made great strides towards providing for the prudent and environmentally sound development of the oil and gas resources of the coastal plains of ANWR, and I thank you very much, Mr. Chairman.

Could I ask unanimous consent that the entire statement be included in the record, since I have just summarized it?

The CHAIRMAN. Yes, without objection.

[The prepared statement of Secretary Lujan follows:]

STATEMENT OF MANUEL LUJAN, JR., SECRETARY OF THE INTERIOR, BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES, UNITED STATES SENATE, CONCERNING S. 406, THE PROPOSED "ARCTIC COASTAL PLAIN COMPETITIVE OIL AND GAS LEASING ACT."

March 6, 1989

Mr. Chairman, it is a pleasure to be here today to testify on S. 406, the proposed "Arctic Coastal Plain Competitive Oil and Gas Leasing Act." I find it particularly appropriate that, at my first appearance before this committee as Secretary of the Interior, I have the opportunity to discuss one of the most important energy and environmental goals of the Bush Administration -- the prudent and environmentally sound development of the coastal plain of the Arctic National Wildlife Refuge (ANWR).

I applaud the Committee's expeditious consideration of this legislation. The President's FY 1990 Budget plan assumes initial ANWR leasing in FY 1990, leading to environmentally prudent exploration and development in the coming decade. Accordingly, the Administration supports most of S. 406's main provisions, and we urge Congress to enact legislation to authorize environmentally sound ANWR mineral leasing as soon as possible. I must point out, however, that the Administration has several concerns regarding the permanent appropriation of

certain ANWR leasing receipts and Land and Water Conservation Fund unappropriated balances. We also have significant questions regarding the proposed Reclamation Fund. I will explain these objections and other concerns later in my testimony.

The President's views on this overall issue are clear. During his recent visit to Alaska, he noted the importance of energy resources to economic development and national security, but emphasized that he "could never support development that failed to provide adequate safeguards for land and wildlife." Alaska's resources, he said, "in all her diversity, are indeed a sacred trust. But I am convinced that our natural resources can be developed without spoiling our environment. The plan to open the coastal plain of the Arctic National Wildlife Refuge meets these twin objectives." I have visited the area twice myself and, based on those experiences and my review of this issue, I wholeheartedly agree.

As you are aware, the coastal plain is a 1.5 million acre area along the northernmost part of the 19 million acre Arctic National Wildlife Refuge located in northeastern Alaska. The Porcupine caribou herd regularly uses portions of the coastal plain during the calving and insect-relief seasons and the coastal plain provides habitat for most of the refuge's muskoxen herd. Portions of the refuge also provide important fall staging areas for lesser snow geese, provide nesting habitat for

waterfowl and shorebirds, and are frequently used by denning polar bears from the Beaufort Sea. Undeniably, the coastal plain is an area of important fish and wildlife resources.

Our task would be easy if the only resources of value in the coastal plain were fish and wildlife ones. This is not the case however. The coastal plain of ANWR is rated by geologists as the most outstanding petroleum exploration target in the onshore United States. Geological data indicate that there is a good chance that the area might contain one or more "supergiant" oil fields, perhaps on the scale of Prudhoe Bay.

We estimate that there is a 19 percent chance of finding economically recoverable oil (fields of more than 440 million barrels of oil) on the coastal plain. This is an exceptionally large field, even by Alaska standards, with a high probability for occurrence of oil and gas. If the coastal plain does contain economically recoverable oil, the average of all estimates of economically recoverable oil resources is 3.2 billion barrels. Based on this mean estimate, production from the area could reduce U.S. imports by nearly nine percent by the year 2005. There even exists a possibility that the area could yield 9 billion barrels of economically recoverable oil, rivaling the size of the Prudhoe Bay discovery.

The goal of this Administration is to recognize both the fish and wildlife and energy values of the coastal plain and to

assist the Congress in fashioning legislation that will provide the American people with the opportunity to benefit from the area's potential mineral wealth, while protecting its unique fish and wildlife qualities as well.

I appreciate this Committee's expeditious consideration of legislation that would accomplish this goal. Mr. Chairman, I know that S. 406 and the proposed amendments thereto are the product of the extensive work done by your committee in the last Congress. I am well aware of the many hours of testimony heard by this committee on this issue from environmental groups, the State of Alaska, industry groups, and Federal witnesses.

This extensive record, coupled with similar work done on the House side and the research and reports done within the Departments of the Interior and Energy, provides clear and convincing evidence that the coastal plain of ANWR should be opened, but only pursuant to legislation that provides strict environmental guidelines and safeguards governing all oil and gas activities in the area. While I have concerns with some of the provisions of S. 406, I believe that this legislation provides those guidelines and safeguards.

I know that some believe it will be too difficult to conduct oil and gas operations in an area where so many safeguards are mandated by law. However, we must acknowledge that ANWR has fish and wildlife values that are important to us as a nation

and those values must be protected. There are others who believe that the only way to protect ANWR's fish and wildlife values is to prohibit oil and gas development there. Although such a prohibition might be the easiest way to protect those values, such a course would foreclose the nation's essential energy, economic, and security concerns. Therefore, I cannot agree that it is the right approach for the nation to take.

Mr. Chairman, as I know you are aware, domestic production of oil is falling. Production from the great oilfield at Prudhoe Bay, which supplies this nation with about 20 percent of its domestic production, is expected to begin declining in 1990. Net oil imports are expected to climb to over 8 to 10 million barrels a day by 1995 -- probably over half of our consumption -- primarily because of rising consumption as our economy continues to grow, and because we are not finding and producing enough oil domestically. President Bush has repeatedly stated that sufficient energy supplies at reasonable prices are vital to the economic well-being of this country and to the preservation of our national security.

I know that some members of this committee argued against the opening of ANWR in the last Congress, believing that the Reagan Administration had not placed enough focus on conservation and conversion to other energy sources. This Administration recognizes that a sound energy policy must look to all available sources. What is available and feasible will, of course, depend

on economics and the state of technology.

President Bush has emphasized his commitment in this area. The President has committed that his Administration will encourage research and development of conservation measures and renewable resources such as geothermal, solar and wind power. Greater emphasis will be placed on the development and delivery to market of alternative fuels. We will work to remove regulatory barriers hindering the use of natural gas and other alternative fuels whenever these options are economical. In the years ahead, as a result of strides in clean coal technology, this country will use more coal. We will also move ahead with the safe use of nuclear power.

However, the reality is that America will, for a long time, depend on oil and gas. The conservation and alternative energy measures that are expected to be economical within the next decade or so will help to reduce our import dependence. Indeed, the Department of Energy projections indicate 4 million barrels per day of additional conservation, but this will not be sufficient to eliminate our Nation's need for imported oil. Currently, our import level is climbing rapidly because of lower energy prices. In 1985, net imports accounted for 27 percent of the total petroleum products supplied in our nation. By 1988, net imports had jumped to 37 percent. By the year 1995, the Department of Energy forecasts that net imports could rise to over 50 percent. If the ANWR coastal plain is opened for

leasing today, and a commercially producible discovery is made, production will not even begin until after the year 2000. Because of the long lead times needed to begin production in an area such as ANWR, it is imperative that we use the energy forecasts now to look ahead and plan for the next century.

Oil and gas production from ANWR's coastal plain would also provide a tremendous boost to the nation's economy. Excluding taxes and royalty payments, oil could cost as little as $8.50 per barrel to find and bring to market. The actual cost per barrel would depend on the amount and location of oil found. We estimate that a 3.2 billion barrel oil field would cost about $11.50 per barrel. The Department of Energy base case forecast for oil prices in the year 2000 is $28 per barrel, which provides a substantial margin in a world of uncertain oil prices. If one assumes that oil prices will average $28 per barrel while ANWR is producing, the nation could save over $50 billion by producing a 3.2 billion barrel oil field in the coastal plain of ANWR rather than buying imported oil. Potential savings of this magnitude cannot be ignored if we are serious about reducing our balance of trade and budget deficit.

During his campaign, the President pointed out that an oil and gas policy for America must do three things --

- find more and conserve more;

- o apply our best technology and ingenuity to our energy problems; and

- o protect the environment in the process.

The prudent development of ANWR's coastal plain in an environmentally sound manner is a critical element of this policy. The legislation before this committee today can play an important role in this nation's energy policy. It will enable us to explore in one of the few remaining areas of high oil and gas potential in this country in a manner more highly protective of the environment than any oil and gas program ever conducted in this country.

As I mentioned at the beginning of my testimony, the Administration does have several concerns regarding the permanent appropriation and Reclamation Fund features of the bill, and other concerns with S. 406. Title V of the bill sets out the distribution formula for revenues derived from oil and gas activities in ANWR. I note that only ten percent of ANWR revenues would be deposited into the general Treasury. The rest would be distributed to the State of Alaska, the Land and Water Conservation Fund, and to an earmarked account for wetlands protection. I also note that the bill would annually credit a special account within the Land and Water Conservation Fund with, in addition to 25 percent of ANWR revenues, an amount equal to the average annual appropriation from the Fund for the

5 fiscal years preceding the date on which ANWR revenues are received--approximately $200 million. After permitting use of up to 25 percent of this special account for State purposes, the bill would make the balance of the account available without further appropriation for Federal recreational land acquisition purposes. In effect, this would create an automatic, uncontrolled spending program for recreational land acquisition that could total several hundred million dollars over the ANWR leasing period. Moreover, the Department of Justice has advised that one feature of this section raises constitutional concerns. We understand that Justice is preparing a report to the committee articulating these and other concerns.

Mr. Chairman, you and the members of this committee are well aware of the budget crisis that this nation currently faces. This Administration has already recognized the need for more land acquisition and increased wetlands protection. The President's FY 1990 Budget plan requested $206 million annually for fiscal years 1990-1994 for recreational land acquisition under the Land and Water conservation Fund. As important as these priorities are, however, they must take their place among other fiscal needs in determining how Federal dollars are allocated. They cannot simply be put on automatic pilot. The annual budget process is the most appropriate means that Congress and the Administration have for weighing our social, environmental, defense, and international needs against each other. We strongly object to language that would exempt several

hundred million dollars from the budget process -- much of which would not even come from ANWR receipts -- and would also increase the Federal deficit by the same amount. The Federal revenues from oil and gas development on ANWR's coastal plain should go to the Treasury where they can best serve the American taxpayer and fund national priorities through the annual budget process. For all these reasons, I urge you to reconsider the provisions of title V.

Regarding the proposed Reclamation Fund, these provisions raise a number of significant legal, policy, and budgetary questions that the Administration has not yet had an opportunity to address fully. For example, it is not clear how Congress can direct that such an entity be established under State law; how such an entity can be subjected to GAO audit; whether investments and expenditures of the Fund should be subject to approval by the Secretary of the Interior; or whether revenues from a "private" Fund should be required to be provided to the Secretary of the Interior and the Director of the U.S. Fish and Wildlife Service. In short, it not clear whether the proposed Fund would truly be private or Federal, or if this entire section is needed in view of the bonding requirements of the bill. The intent of this provision must be clarified and its implications understood before the Administration can express a final position on it, but I can tell you that we object to the earmarking of any unexpended balances of the fund -- which could be enormous after 50 years of compound interest -- to the

Migratory Bird Conservation Fund.

I also am concerned by the fact that the "no significant adverse effect" environmental standard in S. 406 is undefined. As I stated before, I understand and support this committee's desire to adopt a strong protective environmental standard for the area. However, it is imperative that this standard be defined more precisely.

Without a clear definition of the "no significant adverse effect" standard, exploration, development and production in ANWR could virtually be halted. At a minimum, we can be certain that extensive litigation would result and the federal courts would be left to interpret what Congress intended when it set this somewhat ambiguous standard. I urge you to define this term so that both the Federal land manager and the operator have a clear understanding of what is expected of them. We would be happy to work with the committee in developing a workable definition.

I also question the need for the phased leasing provisions of S. 406. Section 203(c) prohibits the Secretary from offering more than 300,000 acres at the first lease sale. This restriction to only 20 percent of the coastal plain is excessively burdensome. I believe that the amount of acreage offered at any sale should be decided by the Secretary. Limited offerings could make it very difficult to achieve a planned

consolidation of facilities and, at the same time, minimize impacts in the area. I question what environmental benefit is achieved by the limitation.

In addition, I believe that the bill's provision that the Secretary must require the application of the "best commercially available technology" for exploration, development and production activities is unnecessary. Mandating technology does not always assure you an environmental result. The "no significant adverse effect" environmental standard, if defined, together with the many other procedural and substantive safeguards in this legislation, provides adequate protection for the fish and wildlife resources of the ANWR coastal plain. I see no reason to mandate the technology an operator must use to meet this standard.

Finally, I note that the Department of Justice believes that S. 406 should contain provisions allowing the Attorney General to conduct an antitrust review of proposed leases, such as is provided in other mineral leasing statutes. We understand that Justice will provide the committee with more details and amendatory language on this issue.

We have also identified other technical concerns with S. 406 and will provide them to the committee before markup of the bill. All in all, however, I am well aware of the extensive work that has gone into the drafting of this bill and I congratulate the

committee on having made great strides toward providing for the prudent and environmentally sound development of the oil and gas resources of the coastal plain of ANWR.

Mr. Chairman, thank you for this opportunity to appear before you. I would be pleased to answer any questions that you or members of your committee might have at this time.

The CHAIRMAN. Mr. Secretary, the drilling on ANWR, the exploratory drilling, will be done in the winter, on ice roads, is that correct?

Secretary LUJAN. Yes, sir.

The CHAIRMAN. And if they are not successful in finding commercial quantities of oil and gas, how much damage will be done by this winter exploratory drilling?

Secretary LUJAN. Virtually none, as I understand it, Mr. Chairman.

The CHAIRMAN. In other words, we can virtually have a look-see at ANWR without leaving permanent scars there?

Secretary LUJAN. Yes, sir.

The CHAIRMAN. Now, there is new technology that allows for slant drilling, so that you do not have to occupy that much of the surface area. Is that correct?

Secretary LUJAN. Yes, sir, it is.

The CHAIRMAN. There is a new field up there that has been recently put on line. Are you familiar with that?

Secretary LUJAN. Yes, sir, I have read about it. I am not totally familiar.

Mr. CASON. Are you talking about Endicott?

The CHAIRMAN. How many acres does that occupy?

Mr. CASON. As Senator Murkowski said, as far as we know, 55.

The CHAIRMAN. 55 surface acres, and it is one of the largest oilfields in the world—the 10th largest oilfield in the United States, is that right?

Senator MURKOWSKI. It is now the ninth. It was the 10th when they opened it.

The CHAIRMAN. It is now the ninth largest field. This new technology, which is a perfection of old technologies, will allow for development of this field if commercial quantities are found, so that there will be relatively little surface disturbance.

Secretary LUJAN. Yes, sir, we believe that.

The CHAIRMAN. Now, the topside of the projections, if there is oil and gas, is a field the size of Prudhoe Bay. We do not expect that, but that would be the case if the best case were true——

Secretary LUJAN. 10 billion barrels, yes, sir.

The CHAIRMAN. And Prudhoe Bay is giving us about 20 percent of our domestic production now?

Secretary LUJAN. Yes, sir.

The CHAIRMAN. And the mean estimate would reduce our imports by 9 percent?

Mr. CASON. Yes.

The CHAIRMAN. Do you have a dollar figure per year on how much that would reduce our trade deficit?

Mr. CASON. No, I do not.

We could supply that for the record, if you like.

The CHAIRMAN. We have had some discussion here about caribou.

Do you know what has happened to the caribou since drilling on Prudhoe Bay? Isn't it true that the size of the Central Arctic herd has tripled?

Secretary LUJAN. My understanding is that it has increased substantially, Mr. Chairman.

The CHAIRMAN. Very well.

Well, I will wait for the later witnesses to ask the technical questions about some of the caribou, because there have been some studies, and there have been some new migratory patterns.

Maybe they are not patterns. The caribou have not used the coastal plain—in the last three years, I believe.

Secretary LUJAN. I have read that it is in the last 2 years, Mr. Chairman, they have not been used for calving. Yes, sir.

The CHAIRMAN. Now, with respect to this standard of "no significant adverse environmental effect," we recognize that there is some ambiguity and vagueness in that standard. It is a word of art used in some of the environmental pollution laws, and perhaps we can struggle here to make it more clear.

But we wanted to establish a very tough standard, and that is why we put it in. People should be aware that this bill, while it allows development on the coastal plain, does so under very stringent standards, and we mean for those to be stringently enforced.

If we can clear up any ambiguity, we would like to do so, and we welcome your suggestions on how to clear that up. But we want to do so within the context of a tough standard.

Secretary LUJAN. We agree with you that there should be a tough standard, Mr. Chairman.

We are just concerned that because of the ambiguity, we could be in court forever. And so, if we can define it—and we would like for our staffs to work together, and we want to work with the Congress——

The CHAIRMAN. We welcome your suggestion as our markups proceed.

Senator McClure?

Senator MCCLURE. Mr. Chairman, as you noted, we have had a number of hearings in the past, and I regard the hearing today as the opportunity for new members of the committee to acquaint themselves with the subject matter, and secondly, to allow witnesses to present to the committee information which was not available at the time we held hearings last year.

And so I will be very brief this morning, and allow the other committee members an opportunity.

In the interest of accuracy, and not because I am nit-picking, Mr. Secretary—although some might think I am—on pages 9 and 10—in your statement, you are critical of the Title V provisions with respect to earmarking of funds.

I would note, just parenthetically, that one statement that you make on the top of page 10 is not quite accurate, in my view. The amount of money which would be placed in the land and water conservation fund as a result of the averages of the past five years would also increase the Federal deficit by the same amount.

That would assume both, that we would otherwise appropriate zero for those purposes, and secondly, that the Gramm-Rudman-Hollings targets would not be met by that increasing amount. Is that not correct?

Secretary LUJAN. Well, what we mean by that is that in the 1990 budget submission, $2.1 billion are included, and if we do not put those into the general treasury, well, that will be that much less, and we have to make it up somewhere else.

Senator MCCLURE. Well, I understand the general thrust of what you are saying. But technically, that statement is inaccurate for two reasons.

Secretary LUJAN. I do not think so, but let me check.

Senator MCCLURE. Well, how would it increase the Federal budget deficit?

Secretary LUJAN. Because we would not put into the General Treasury $2.1 billion that we are anticipating putting into the General Treasury.

Senator MCCLURE. Well, unless you get a bill, you will not get any revenues, will you?

Secretary LUJAN. That is correct.

Senator MCCLURE. So if we do not pass a bill that adds money to the Federal Treasury you would consider that as an action contributing to the deficit?

Secretary LUJAN. That is correct.

The CHAIRMAN. Well, it adds to the Federal deficit because you have $2.1 billion phantom dollars in the President's budget from this source.

Secretary LUJAN. Mr. Chairman, we hope it is not phantom. We hope you pass this bill.

The CHAIRMAN. Well, we do, too. But you are not going to get that money in the Federal budget.

Senator MCCLURE. Well, we will have the opportunity to explore that further. But I understand what your meaning is.

I just want to remind the Administration again, as we have occasionally had to in the past, that the President makes proposals on the budget, and the Congress works on those proposals. Once the process is completed these are often significant differences between the original submittal and the finished product.

This statement would presume that the budget proposals by the President are those which are adopted by the Congress.

Mr. Chairman, I will reserve the balance of my questions.

The CHAIRMAN. Thank you very much, Senator McClure.

Before I call on Senator Wirth, may I ask you just one quick question?

On page 46 of the 1002 report, it states that there are fewer than 3,000 recreation visits annually to ANWR. Is that still a correct estimate?

Secretary LUJAN. Yes, that is my understanding. Yes, sir.

The CHAIRMAN. Senator Wirth?

Senator WIRTH. Thank you very much, Mr. Chairman.

Mr. Secretary, do you have an Undersecretary on board at the Department of the Interior?

Secretary LUJAN. I am sorry?

Senator WIRTH. Do you have an Undersecretary?

Secretary LUJAN. Yes, we have an undersecretary, yes.

Senator WIRTH. Not a new one. Do you have an Assistant Secretary for Fish, Parks and Wildlife?

Secretary LUJAN. Yes, we do.

Senator WIRTH. Is that a Bush appointee?

Secretary LUJAN. No, not yet. I am the only new Bush appointee there, at the moment.

Senator WIRTH. Excuse me.

Secretary LUJAN. I am the only Bush appointee there at the moment.

Senator WIRTH. So the new Administration does not have any people at the Department of Interior to review its prospective policies being made, is that right?

Secretary LUJAN. They have me.

Senator WIRTH. You are doing this yourself, then?

Secretary LUJAN. No. But I do not know that that really makes any——

Senator WIRTH. Well, it is just a matter of curiosity.

We see the lightning speed with which the Administration is coming out of the starting blocks, and I notice that this train is coming down the tracks, and it seems to move. We have got a lot of train still left in the roundhouse, downtown. I would hope that we might get some kind of an independent assessment, rather than just picking up from the previous administration.

But we are picking up from the previous administration, so the assumption is that all of the data that was available from the previous administration was adequate to make the decision in front of us, and that is the argument that is being made here.

It seems to me that there are a variety of items that have still been requested by this committee and have not been forthcoming, for example—when we last addressed this issue a year ago, we were assured by the Department of Interior, your predecessors, that the highly critical comments of the Environmental Protection Agency made by the Environmental Protection Agency on the Arctic EIS were "misunderstandings," and that the Department of Interior was "working with the EPA to clear up these misunderstandings."

What have you all done to "clear up the misunderstandings" with the EPA?

Secretary LUJAN. Well, my understanding is that there were numerous meetings held between the Department and EPA, and that EPA subsequently testified before this committee that it believed the 1002 report was adequate for the purpose for which it was intended. So there was apparently some initial misunderstanding.

Senator WIRTH. You know, is there some kind of written documentation to counter what went on previously?

Secretary LUJAN. My understanding is that EPA testified before this committee.

Senator WIRTH. Well, can you provide us what the disagreements—what the misunderstanding was, and provide that for us for the record? What were the misunderstandings? Your words that there were misunderstandings—I mean, your agency's words that there were misunderstandings between the Department of Interior and the EPA, and if that was the case, maybe we can get back from you what those misunderstandings were, and have them resolved.

Secretary LUJAN. Ms. Lamson could answer those for you, right now.

Senator WIRTH. Maybe you could just make those available to us for the record.

Could you do that?

[The information follows:]

DRAFT

In an effort to better understand the Environmental Protection Agency's (EPA) concerns over the 1002 Report, the Fish and Wildlife Service's (Service) Regional Director for Alaska and his staff met with EPA's Assistant Regional Administrator and his staff. At that meeting, the Service responded to points raised by EPA, and provided a better understanding of the process used and conclusions drawn in the 1002 report. As a follow-up, Service technical staff met with EPA's Alaska Operations staff for more detailed discussions about air quality and other data which was not available at the time the report was finalized. Then-recent reports on cumulative impacts on North Slope shorebirds and on post-construction monitoring of the Endicott project were also discussed.

Additional meetings between the Department and EPA were also held. We explained the Department's view that the 1002 report is a programmatic document intended to serve as a basis for Congress' policy decision on whether to open ANWR for oil and gas activities. We thus assumed during preparation of the report that compliance with the National Environmental Policy Act (NEPA) would be achieved at each stage of leasing and development. This served to assure EPA that a number of its concerns relating to site-specific activities would be addressed in the course of that compliance.

We have also clarified to EPA that it has always been our assumption that all existing environmental laws will apply to ANWR. EPA felt that the report was not clear on this issue.

In addition, EPA had raised several specific concerns, regarding the report's analysis for air quality, water and gravel supplies, marine transporation facilities, and protection of caribou calving grounds.

With respect to air quality, EPA raised the concern that data gathered during 1986 and 1987 at Prudhoe Bay were not used by us, and that primary and secondary air quality effects were not assessed adequately. The report did use Prudhoe Bay monitoring data (Table II-1, page 16) which EPA has reviewed and accepted as meeting its siting, quality assurance and other monitoring guidelines. Primary and secondary air quality effects, including arctic haze and secondary air quality effects, are addressed both in Chapter VI of the 1002 Report and in the response to public comments (pages 198-199).

Moreover, our report acknowledged the limited data from Prudhoe Bay and the fact that the degree and kind of emissions that might occur in the 1002 area will be influenced by the type of fossil fuels discovered and by the combustion equipment used in the area's development. Our review of air quality in the coastal plain did not end with the 1002 report. The information EPA noted, some of which became available after the 1002 report was published, will be among that used during our site-specific NEPA compliance.

With respect to water and gravel supplies, EPA raised the concern that the report does not show whether water and gravel supplies are adequate to support the recommended action in ANWR. Limited availability of fresh water for oil-related activities is not unique to the 1002 area, and the situation has not precluded development elsewhere, including Prudhoe Bay. This is pointed out in the report on page 85. The report, at page 111, suggests a number of ways that additional water sources could be created, and many of these have been addressed during hearings before the Committee.

The occurrence of gravel on the coastal plain is discussed on page 13 of the 1002 Report, and potential gravel sources for the development scenarios described in the report are covered on pages 111 and 112. The report makes it clear that adverse effects can be minimized by obtaining gravel from exposed and unvegetated bars along streams that are not fish-bearing. Gravel is also available from terraces immediately adjacent to river banks and river beds. The U.S. Geological Survey has reported that the 1002 area has abundant gravel resources that would be sufficient if development is authorized.

EPA also expressed concern with respect to the marine transportation facilities assumed in the full development scenario and their impact on anadromous fish. EPA's main concern in this area was the possible cumulative effect on these fish. The development infrastructure outlined in the report was a highly generalized hypothetical scenario based on typical North Slope oil prospect characteristics, and assumed successful oil exploration in all three prospective areas. We believe that our consideration and evaluation of all three prospective blocks represents an adequate cumulative effects assessment for purposes of a programmatic EIS.

In addition, the report's recommended mitigation measure is to construct docks and causeways so as not to impede fish movements or change lagoon water chemistry. EPA Regional Administrator Russell testified before the Senate Committee on Environment and Public Works on December 10, 1987, that accomplishment of this mitigation as described, through use of alternatives such as pile-supported causeways or subsea pipelines, would eliminate the basis for EPA's concern.

Finally, EPA expressed concern about the protection of the caribou calving areas. They commented that we relied too much on data on the Central Arctic Herd's experience with Prudhoe Bay and overlooked available data on the Porcupine Caribou Herd (PCH). However, we have emphasized that comparisons of these two herds should be used with caution. That was stated in the report and in the Secretary's recommendation. In fact, the report expressly points out that the potential for distributional changes in the PCH is present. We do not consider this an underestimate.

EPA also pointed out that a large body of information on the PCH has been gathered by the Service in the last few years, data EPA believed was not adequately represented in the report. However, all available caribou information was considered by the Department in its analysis of potential impacts. It is important to note that the Final Baseline Report cited by EPA was just that -- a report on available baseline information on the PCH. Information on the impact of oil and gas activities on the PCH is limited to the minimal effects of exploration activities.

The basic difference between the Department and EPA involves the depth of the report on various issues of concern. On this point, it is important to recognize that the 1002 report is a summary of years of research and analysis on this issue. Volumes of studies and other material were relied upon in preparing the report. Our intent was to summarize the results of those studies and analyses for use by the Congress in determining whether this area should be opened to oil and gas leasing. Later, site-specific documentation will of course be much more detailed.

In summary, we have agreed with EPA that the on-going NEPA process is the appropriate means of addressing the many environmental considerations inherent in an environmentally-sound leasing program for ANWR, should the Congress authorize leasing there.

The Environmental Protection Agency testified before the Committee on October 13, 1987 that it believed the Congress had sufficient information upon which to make a decision on whether to authorize ANWR leasing.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

APR 1 1988

Honorable George J. Mitchell
Chairman, Subcommittee on Environmental
Protection
Committee on Environment and Public Works
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

At the December 10, 1987, hearing on S. 1804, concerning the Arctic National Wildlife Refuge (ANWR), you asked that I provide to the subcommittee a response to the concerns raised with respect to this Department's Final Legislative Environmental Impact Statement for ANWR (the 1002 report) by Robie Russell, Regional Administrator of the Environmental Protection Agency (EPA) for Region 10, which includes Alaska. I appreciate this opportunity to provide you with our response.

First, let me bring you up to date on what we have done in response to EPA's concerns. In an effort to better understand and respond to them, I asked the Fish and Wildlife Service (FWS) to meet with representatives of EPA's Alaska Operations Office. FWS's Regional Director for Alaska and staff thus met with EPA's Assistant Regional Administrator and staff. At that meeting, FWS responded to points raised by EPA and provided a better understanding of the process used and conclusions drawn in the 1002 report. As a follow-up, FWS technical staff met with EPA's Alaska Operations staff for more detailed discussions about air quality and other recent data which had not been available at the time the report was finalized. Recent reports on cumulative impacts on North Slope shorebirds and on post-construction monitoring of the Endicott project were also discussed.

Additional meetings between Interior and EPA have resulted in mutual resolution of two significant issues. First, we have explained this Department's view that this report is a programmatic document intended to serve as a basis for Congress's policy decision on whether to open ANWR for oil and gas activities. We thus assumed during the preparation of the report that compliance with the National Environmental Policy Act (NEPA) would be achieved at each stage of leasing and development. This has served to assure EPA that a number of its concerns relating to site-specific

activities will be addressed in the course of that compliance.

Additionally, we have clarified to EPA that it has always been our assumption that all existing environmental laws will apply to ANWR. EPA felt that the report was not clear on this issue. With these new understandings, EPA's concerns are better placed in context.

EPA also expressed concerns with respect to the report's analysis of air quality, water and gravel supplies, marine transportation facilities, and protection of caribou calving areas. Our responses to those concerns follow.

With respect to air quality, EPA raised the concern that data gathered during 1986 and 1987 at Prudhoe Bay were not used by us and that primary and secondary air quality effects were not assessed adequately. The report did use Prudhoe Bay monitoring data (Table II-1, page 16) which EPA had reviewed and accepted as meeting its siting, quality assurance and other monitoring guidelines. Primary and secondary air quality effects, including arctic haze and acid precipitation, are addressed both in chapter VI of the report and in the response to public comments (pages 198-199).

Moreover, our report reflected the limited data from Prudhoe Bay and the fact that the degree and kinds of emissions that might occur in the 1002 area will be influenced by the composition of the fossil fuels discovered and by the combustion equipment used in the area's development. Certainly our review of air quality in the coastal plain does not end with the 1002 report and the information that EPA has noted, some of which became available after the 1002 report was published, will be among that used during our site-specific compliance with NEPA.

With respect to water and gravel supplies, EPA has raised the concern that the report does not show whether water and gravel supplies are adequate to support the recommended action in ANWR. Limited availability of fresh water on the coastal plain is not unique to the 1002 area and has not precluded development at Prudhoe Bay. This is pointed out in the report on page 85. The report, at page 111, suggests a number of ways that additional water sources could be created.

The occurrence of gravel on the coastal plain is discussed on page 13 of the report and potential gravel sources for the development scenarios described in the report are covered on pages 111 and 112. The report makes it clear that adverse effects can be minimized by obtaining gravel

from exposed and unvegetated bars along streams that are not fish-bearing. Gravel is also available from terraces immediately adjacent to river banks and terraces immediately adjacent to river beds. The U.S. Geological Survey has reported that the coastal plain has abundant gravel resources that would be sufficient if development is authorized.

EPA also expressed concern with respect to the marine transportation facilities assumed in the full development scenario and their impact on anadromous fish. EPA's main concern in this area is what the cumulative effect will be on these fish. The development infrastructure outlined in the report was a highly generalized hypothetical scenario based on typical North Slope oil prospect characteristics and assuming successful exploration in all three prospective areas. We believe that our consideration and evaluation of all three prospective blocks represents an adequate cumulative effects assessment for purposes of a programmatic EIS.

In addition, the report's recommended mitigation measure is to construct docks and causeways so that fish movements are not impeded and lagoon water chemistry is basically unchanged. As Robie Russell testified before your subcommittee on December 10, 1987, accomplishment of this mitigation as described, through use of alternatives such as pile-supported causeways or subsea pipelines, would eliminate the basis for EPA's concern.

We further note that approximately $2 million in Fiscal Year 1988 funds was appropriated for research and studies of the coastal plain of ANWR. The President has requested that this funding be continued in Fiscal Year 1989. Additions to the coastal plain data base will include gathering hydrological and biological data to support site-specific decisions affecting competing requirements for the water resources of the coastal plain. Research studies will focus on predicting, assessing, and minimizing or otherwise mitigating impacts of specific development activities on caribou and related species, and on snow geese and other migratory waterfowl. Potential impacts to migration and feeding areas for anadromous fish species in the Beaufort Sea will be the subject of a long-term study to provide information on how to minimize such impacts.

Finally, EPA expressed concerns about the protection of caribou calving areas. EPA commented that we relied too much on data on the Central Arctic Herd's experience in Prudhoe Bay and overlooked available data on the Porcupine Caribou Herd (PCH). However, we have emphasized that

comparisons of these two herds were used with caution. This was stated in the report and in the Secretary's recommendation. In fact, the report expressly points out that the potential for distributional changes in the PCH is present. We do not consider this an underestimate.

EPA also pointed out that a large body of information on the PCH has been gathered by FWS in the last few years, data that EPA believed were not adequately reflected in the report. However, all available caribou information was considered by this Department in its analysis of potential impacts. Moreover, the Final Baseline Report cited by EPA as not being adequately reflected in the report emphasizes baseline information on the herd. Impact information on the Porcupine Caribou Herd is limited to exploration.

The thrust of the differences between EPA and Interior involves the depth of the report on various issues of concern. On this point, it is important to recognize that the 1002 report is a summary of years of research and analysis of this issue. Volumes of studies and material were relied upon in preparing the report. Our intent was to summarize and present the results of that study and analysis in a readable and manageable fashion for use by the Congress in its policy role of determining whether this area should be opened. Later site-specific documentation will, of course, be much more detailed and will further address EPA's concerns.

In summary, we have worked closely with EPA over the last several months on this matter. In doing so, we have agreed that the ongoing NEPA process is the appropriate means of addressing the many environmental considerations inherent in an environmentally sound leasing program at ANWR. Thus, as EPA testified before the Senate Energy and Natural Resources Committee on October 13, 1987, we both believe that Congress now has sufficient information to determine ANWR's role in our energy future.

Sincerely,

William P. Horn
Assistant Secretary

cc: Honorable John H. Chafee, Ranking Minority Member, Committee on Environment and Public Works, Subcommittee on Environmental Protection

Senator WIRTH. Also, since the last committee hearing on this issue, additional information was released on the extent of oil development impacts at Prudhoe Bay. A report entitled "Comparison of Actual and Predicted Impacts of the Trans-Alaska Pipeline System and Prudhoe Bay Oilfield on the North Slope of Alaska" which had been requested by, I believe, Congressman Miller, or at least the House Interior Committee, almost 2 years ago, has not been seen as far as I know by the Congress.

That was referred to in terms of a discussion that was in the newspapers a year ago, but we have not seen that, I do not think, have we?

Secretary LUJAN. Let me turn that to Ms. Lamson, because she is the one familiar with that.

Ms. LAMSON. I will double-check, but I know for sure that information was submitted to Chairman Miller.

Senator WIRTH. I think there was a 3-page summary of that information. Could we get the 60-page report?

Ms. LAMSON. Absolutely.

Senator WIRTH. If there was a 60-page report? Can we get whatever existed?

Ms. LAMSON. Yes, sir.

In fact, at that time last year, it was also the subject of a hearing, and Chairman Miller did ask for the original draft document upon which the 3-page summary was based, and we did provide that.

Senator WIRTH. Could you provide that to this committee?

Ms. LAMSON. Yes, sir.

Senator WIRTH. And could that be included in the record[1] as well, Mr. Chairman? That is the second piece of information—not the revenue studies, but at least we ought to have what is available.

Senator WIRTH. Let me refer to a recent quote in the New York Times—and I think this was an EPA document—I will read the New York Times. Have you seen—have you seen this, Mr. Secretary?

Secretary LUJAN. I have not.

I understand it is an unpublished report, so I would have no occasion to see it.

The CHAIRMAN. I think it is only a draft staff report.

Senator WIRTH. Could we make that available as well?

Secretary LUJAN. That is EPA. We would not have it.

Senator WIRTH. Well, if this is an administration policy, to open up ANWR, should we not have access to the information that the administration is operating off of?

Secretary LUJAN. I do not believe we have it, Senator.

Senator WIRTH. Could we ask you? I mean, we are in such a hurry that we cannot ask anybody from EPA to come up here. So maybe we can ask you, as a representative of the administration, to get the information from the administration. Can we ask?

Secretary LUJAN. I will ask EPA for the copy, and if I get one, I guess I can——

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[1] Information to be supplied for the record appears in Appendix I.

Senator MCCLURE. Mr. Chairman, I would like to reserve the right to object for a moment, if I might.

As I understand, this is a draft document which is referred to in the Times article, and I am not certain it is the practice of the committee to accept for the record preliminary documents that are still under discussion, until they have been finalized. Further it is my understanding that EPA was going to and had given assurances to both the environmental community and the energy community that the draft document would be available to them for comments before it was finalized.

I assume in the process it will surface as people are given copies of it for comment. But I do not think we should get to the point that any draft document, whether it be by a member of the staff of this committee or any other organization, is viewed as an official pronouncement.

Senator WIRTH. I do not think anybody is suggesting—if I might respond—I do not think anybody is suggesting that this official—that this is an official pronouncement.

What we are being asked to do is—I think in a very short period of time—to be making a decision, and we have been told that it is unnecessary for us to do any further studies.

The only thing that I am suggesting, Senator McClure, is that we at least ought to have access to those studies that have been done. And there was this original Department of Interior Fish and Wildlife study which we have not seen. There was this study that Congressman Miller had asked to be done, which we have not seen. There is this study that we have not seen. And I think it is perfectly reasonable for us to at least have the information available to the committee that the administration is making its decision on.

Maybe that will be very convincing and we will vote unanimously to pursue the policy recommendation by Mr. Lujan. I do not know, because I have not seen that information.

Secretary LUJAN. Senator, let me put this down.

I have written down EPA unpublished report, Wirth vs. McClure, and I will discuss it.

Senator WIRTH. This is not Wirth vs. McClure. If I might, Mr. Secretary, it is Murkowski vs. the New York Times. [Laughter]

Secretary LUJAN. Let me leave it at this.

Let us pursue that, as to whether I should or whether I should not. I am too new. And we will leave it up to the committee.

If the committee asks me to do that, I will be happy to, and I do not mean to be ignoring it. But I am not sure how to proceed here.

The CHAIRMAN. Well, obviously you do not have the report. Some members of the environmental committee obviously do, and I would suggest that they furnish copies to us.

Senator WIRTH. Well, I would say that the administration must as well, if it is an administration report. It is not just the New York Times and the environmentalists. The administration must have it.

The CHAIRMAN. It was a staff draft.

Senator WIRTH. Well, the staff does not work for the administration, they work for someone else now?

Senator McCLURE. Mr. Chairman, you and I would both know that staffs produce a variety of documents for discussion purposes, which are sometimes modified and sometimes withdrawn.

And yet, if we ask for and get a staff draft which is then made a part of the file, it looks like an official document. That is misleading to the public as well as to others.

I suggest that the administration—this or any other administration—is entitled to their internal discussion documents, and they are entitled to release the final conclusions that they reach. We do not have the right, I do not believe, to reach beyond that, even though somebody may have leaked to the New York Times, or, I think, in the language of the New York Times article, somebody has seen a draft.

I am not sure whether they have it or whether they just saw it, whether they were invited in after hours to look, or whether they were given a piece of paper. But I think that we are not on firm ground if we start in asking the administration to provide executive documents before they are finalized.

The CHAIRMAN. I would suggest that those that have the document let us see a copy of it. Our minds will not be polluted by looking at it, I can tell you.

One wonders why the timing of the report happened to be today, when we began hearings. But all of those things can be taken into consideration.

Anybody who has any documents or anything that relates to this, we would like to see them, so I would suggest that they furnish them to the staff here, and we will give out copies of them.

Senator WIRTH. Might we agree, Mr. Chairman, if we are not going to get that report?

The CHAIRMAN. Well, I am suggesting that we get it.

Secretary LUJAN. Let me ask, how do I proceed here?

You want it. The Chairman apparently does not want me to give it to you. If I could get my hands on it—which I do not have——

Senator WIRTH. Well, let me ask you this—are you curious about it?

Secretary LUJAN. I am.

Senator WIRTH. Well, great. You will be getting it, then. I assume you can get it. Can you get it, Mr. Lujan?

Secretary LUJAN. I do not know.

Senator WIRTH. Do you think you can get it?

Secretary LUJAN. I do not. I really do not.

Senator WIRTH. Mr. Chairman, would it be possible to include in the record Mr. Shabecoff's article, or should we——

The CHAIRMAN. If you want to put it in, we can do that.

Senator WIRTH. Let us do that, Mr. Chairman.

[The article follows:]

OILFIELD PRACTICES VIEWED AS THREAT TO LAND IN ARCTIC—DAMAGE TO TUNDRA CITED—E.P.A. REPORT FAULTS INDUSTRY IN MANAGEMENT OF WASTES ON ALASKA NORTH SLOPE

(By Philip Shabecoff)

WASHINGTON, Mar. 4.—Improper and careless management of chemical and oil wastes on Alaska's North Slope is seriously damaging the delicate tundra environ-

ment there, according to an unpublished draft report by the Environmental Protection Agency.

The report documents acres of tundra blackened by chemical spills, oil wastes seeping from drilling pads, stacks of leaking chemical drums, a mine flooded by a diverted river, overflowing waste disposal pits, failure to comply with Federal regulations governing the handling of hazardous materials and other threats to the Arctic environment by oil industry and service company operations in the Prudhoe Bay area.

Environmentalists who have seen the draft report said it strongly supported their contention that oil operations should be prohibited on the coastal plain of the Arctic National Wildlife Refuge, just to the east of the Prudhoe Bay fields.

DECISION ON WILDLIFE REFUGE

Congress is likely to decide this year whether to allow oil development within the refuge or to add the land to the National Wilderness System, which would protect it from any development. In the Reagan Administration the Interior Department recommended full development of the coastal plain.

Joseph A. Lastelic, a spokesman for the American Petroleum Institute, a major oil industry trade group, said the institute would comment in detail when it had studied the report. But he added, "Based on 20 years of petroleum operations on the North Slope of Alaska, exploration and production waste practices meet or exceed government regulations and sound environmental guidance."

The oil industry has called the coastal plain the country's most promising area for a major new oil strike. Current estimates say that there is one chance in five of making such a strike in the refuge but that if there is a find it could produce as much as 3.2 billion barrels of oil.

The refuge's coastal plain is the breeding ground for North America's largest remaining herb of migratory caribou as well as the habitat of polar bears, musk oxen, wolves, arctic foxes and a rich variety of waterfowl and fish.

ENVIRONMENTALIST UNEASY

"This report makes me very nervous about what would happen if the oil industry were allowed into the Arctic Wildlife Refuge," said Ann Strickland, deputy general counsel to the National Audubon Society who is a former enforcement attorney for the Environmental Protection Agency.

Lisa Speer, an expert on oil development effects on the environment for the Natural Resources Defense Countil, a national environmental group, said, "The report and other recent information indicate that oil development would transform this spectacular and fragile wildlife refuge into a massive industrial complex."

On Friday, Congress's Office of Technology Assessment issued a report saying that if the oil operations were permitted in the Arctic refuge, development there would resemble what has occurred in the Prudhoe Bay area, with extensive road and pipeline networks, gravel pads, airfields and docks "and other facilities in the middle of a land with few signs of man's presence."

The report, a copy of which was given to the The New York Times, says the State of Alaska, which has responsibility for regulating waste management on the North Slope, does not have enough authority or resources to enforce antipollution laws properly. It notes that the state cannot halt drilling or impose fines when it finds violations without first going through long and costly legal procedures, which it largely avoids.

The E.P.A. report was prepared by agency officials who toured a sampling of sites on the North Slope in the fall of 1987 and again last summer, accompanied by oil company personnel and officials of the Alaska Department of Environmental Conservation.

NOT REVEIWED BY MANAGERS

Sylvia Lowrance, director of the E.P.A. office of solid waste, said that the report was a staff draft that had not yet been reviewed by senior managers. She said that she could not comment on its contents.

Among the violations and evidence of environmental damage in the report were these:

At a facility operated by Dowell-Schlumberger, a major oilfield service company, the study found hundreds of gallons of spilled materials, leaking drums and "significant amounts of an unidentified thick white liquid substance were observed flowing off the pad into the tundra." The wastes gave off a "strong chemical odor." Around

the site were "60 acres of dead contaminated tundra." The flooding effectively prevented the reclamation of the mine site, which was required by law.

A waste disposal facility operated jointly by Arco Alaska and the Standard Alaska Production Company appears not to be containing a variety of wastes properly. Cracks were found in a waste pit lining and oil stains were found around the site. Wastes injected into the ground at this and other sites may be turning the Prudhoe Bay field "sour" from high conentrations of hydrogen sulfide.

Arco is failing to handle wastes from a small refinery it operates on the North Slope even though the law requires that refinery wastes be carefully controlled as potentially hazardous.

Oil-based wastes were improperly disposed of in an unlined pit at a Standard drill site and piles of contaminated snow were dumped onto the tundra. Oil wastes seeped from another Standard drill pad on to the nearby tundra.

At an abandoned hotel site in the the town of Deadhorse, which serves as a supply center for Prudhoe, there were piles of leaking chemical drums, used batteries and "general debris." Diesel spills on the hotel lot were seeping into a nearby lake that is a source of drinking water for the community.

The report did not attempt to assess the biological effects of this contamination. But a report last year by the Fish and Wildlife Service found wide destruction of vegetation and depletion of wildlife. Last fall the service reported finding the carcass of a polar bear that had been killed by ingestion of ethylene glycol and Rhodamine-B, toxic chemicals found in dyes used to mark road-ways and airstrips on the North Slope.

REPORT CALLED "SLANTED"

William A. Webb, manager of member services for the Alliance an association of 250 companies in Alaska that supply or otherwise benefit from the oil industry on the North Slope, including Dowell-Schlumberger, said he had seen a draft of the E.P.A. report and found it "very slanted."

Jim Yeager, manager of environmental services for Arco Alaska, said he had not seen the report and could not comment on its contents. He said, however, that "it is certainly company policy" to comply with environmental regulations. A spolkesman for Standard Alaska Production Company said he could not comment without seeing the report.

Senator WIRTH. I think we can at least get that far, that there is a significant amount of controversy surrounding what the impacts on ANWR would be.

Secretary LUJAN. Are you satisfied now with all this discussion with the fact that I cannot give it to you?

Senator WIRTH. No, I am not.

I think that if you can get it, we will mark it staff draft, and all that kind of good stuff. I will bet you we can get a copy.

I was just hoping that we might get one from Mr. Lujan, and that would assure us that you had it, and that you were reviewing it and looking at it, which I would certainly like you to do.

The CHAIRMAN. I was not very curious about it at first, but I certainly am now. [Laughter]

Senator WIRTH. It probably is as anesthetizing as most of the documents. The hearings are more interesting than the documents, I think.

Thank you very much, Mr. Secretary. Thank you, Mr. Lujan.

The CHAIRMAN. Thank you, Senator Wirth.

Senator Murkowski?

Senator MURKOWSKI. Thank you, Mr. Chairman.

Mr. Secretary, I wonder if you could give us some information relative to how long it might be assuming they did find a major discovery in ANWR, before it would be on line?

In other words, how long would it take to develop the field?

Secretary LUJAN. 10 years to develop. My understanding is that it would not flow until the year 2000.

Senator MURKOWSKI. So we are looking at 10 to 12 years. When one reflects on whether or not we need that oil now. Together with the reality that we are currently utilizing 50 percent of our production from imports, it is anyone's guess where we will be 10 years from now.

Secretary LUJAN. It will probably be more than 50 percent, because of the dwindling amounts that will be coming out of Prudhoe Bay.

Senator MURKOWSKI. Mr. Secretary, there is a reference to a recently released—and I hate to continue to harp on reports, because we seem to have a rash of recently released reports. This is the office of technology report, indicating that Interior's estimate of a 19 percent chance of finding economically recoverable reserves is too low. The Energy Information Agency's estimate of virtually certainty is much more realistic.

Can you explain to me a bit, that means?

Secretary LUJAN. Well, we are proceeding on the basis of a 19 percent chance of recovery. That is the figure that we have given to you, and the figure that we have gone along with all the time.

But even at that, my understanding is that 19 percent is very, very good when you are going into a field that we do not—it is not a previously discovered—there has not been previously discovered oil there. And so, now, if it is virtually certainty, why, that would mean that the percentage would be higher—but 19 percent is what we are going on at the moment.

Senator MURKOWSKI. In one of the earlier Interior estimates, there was an estimate the field might contain as much as two percent of our nation's reserves.

How does this equate to this 19 percent that we are coming up with now, for chances of finding economically recoverable reserves? Does this raise that two percent, theoretically?

Mr. CASON. No, it was based on that.

Senator MURKOWSKI. What does 2 percent mean? Someone told me that means 1 million barrels for 30 years.

Mr. CASON. No, not that.

Senator MURKOWSKI. What is it? What does 2 percent mean?

[The information follows:]

ANWR's position in our national resource picture can be viewed a number of ways. ANWR represents undiscovered economically recoverable resources. USGS and MMS are updating this estimate for the U.S. and it is unavailable at this time. Based on the recent trends in these estimates, ANWR would be approximately 2 percent of these resources.

Total U.S. proved reserves currently total about 25 billion barrels. If ANWR contains oil and the mean of 3.2 billion barrels is found, then it would be about 13 percent of proved reserves. If another Prudhoe sized discovery is found, then ANWR would make up about 30 percent of proved reserves.

It is difficult to explain this in terms of production since oil production peaks early in life, then enters a long decline period. If the mean value of 3.2 billion barrels is found, peak production would amount to 800,000 barrels per day. A Prudhoe size field could produce 2 to 2.25 million barrels per day if transportation capacity is available.

Mr. CASON. Our reserve base—you basically make a calculation of how many fields have been discovered. Then you have engineering estimates to calculate how much oil is in place, and how much

of that is recoverable. Then all of that is added up and in this case compared to what we have as resource estimates in place, and recoverable in ANWR, to get to the 2 percent.

Senator MURKOWSKI. OK.

What percentage of that or better yet how much oil does that equate to?

Mr. CASON. The 2 percent figure, I believe—that would be estimated against our mean recoverable estimate, the 3.2 billion barrels.

Senator MURKOWSKI. You do not want to convert that down to production rate per day?

Mr. CASON. Not at this time.

You have to go through a process of actually doing the exploration, and get to the discovery before you calculate how much you would have in production.

Senator MURKOWSKI. I would like for the record, Mr. Chairman, to have Interior reflect on that answer, because the last time I asked the same question, Interior responded by indicating that 2% equated to 1 million barrels for 30 years.

Mr. CASON. A million barrels daily?

Senator MURKOWSKI. A million barrels of production for 30 years, if the current production for Prudhoe Bay is 2 million barrels, which represents 24 or 23 percent, then a million barrels would equal about 12 percent.

Mr. CASON. We will give you a full explanation on that.

Secretary LUJAN. It is just a question of mathematics. That sounds kind of right to me, if you are taking about 3.5 billion, and you have got 360—well——

Senator MURKOWSKI. I do not want to pursue this. My time is limited, and I am still in good grace with the Chairman, and I might not be, if I go over too much. [Laughter.]

The office of technology on Friday allegedly made some reference that if the oil operations were permitted in the Arctic refuge, development would resemble what has occurred in the Prudhoe Bay area, including extensive road pipeline network, gravel pads, airfields, stocks, and other facilities.

It is my understanding at ANWR, if they did make major discoveries, companies would utilize the existing Prudhoe Bay pipeline terminus, and bring a lateral line over some 65 or 70 miles, and use the existing facilities at other points.

I am wondering if you could indicate the necessity of docks and major sites in ANWR?

Secretary LUJAN. Well, only to get the oil from ANWR over to——

Senator MURKOWSKI. Well, that is just a pipeline.

Secretary LUJAN. That is very minimal.

Senator MURKOWSKI. So you would counter the statement that you would have a duplication of development?

Mr. CASON. I think that is true.

What you would have is, depending on where you have the discoveries, you would have a series of gathering lines to some central terminus, either inside or just immediately outside of ANWR, where you would pipe it over the trans-Alaska pipeline.

Senator MURKOWSKI. Mr. Chairman, much has been made of comparisons, and we all do comparisons, because it is how we visualize impacts or footprints.

Do you consider the estimate of 12,500 acres as the amount of land that if every lease were sold in ANWR, and if every lease were developed, which is unlikely, that the footprint would be approximately total size or in other words, about the area set aside for the Dulles International Airport?

Secretary LUJAN. My understanding—at least all the literature that I read—says 11,000, rather than 12,500.

Senator MURKOWSKI. And that is because of new technology?

Secretary LUJAN. Yes, sir.

Senator MURKOWSKI. Now, we can take Yellowstone and Grand Canyon National Parks as matters of comparison. I am told that Yellowstone contains 2,219,000 acres, in the Grand Canyon, 1,218,000 acres.

I am told Yellowstone attracts approximately 1,069,000 visitors, and Grand Canyon attracts 3,800,000 and I am told, as a comparison, ANWR has 18 million acres and attracts about 3,000 visitors, at a cost of about $4,000 per round trip from Seattle, Washington.

Do you know if those figures are correct?

Secretary LUJAN. That is my understanding, that that is the number of visitations.

Senator MURKOWSKI. Well, Mr. Chairman, I would like to ask one more question, and that is in regard to the commitments that we have around the world to maintain the free flow of oil.

I think that we recently saw the presence of some 30 U.S. Navy ships and 15,000 sailors, some of whom sacrifice their lives to keep the free flow of oil for the benefit of all nations of the world.

How do you view the general commitment to put American lives at stake to keep the free flow of oil froma the mideast, as a backdrop to making a determination about whether we are going to allow ourselves to have the right to explore for oil in ANWR—because we do not know that the oil is there, do we?

Secretary LUJAN. No.

Senator MURKOWSKI. And you are satisfied that Interior does not know whether there is huge resources there, and if there is no oil there, then I would assume that area would revert to what?

Secretary LUJAN. Back to the way it was before.

Senator MURKOWSKI. Mr. Chairman, I have no further questions.

The CHAIRMAN. Senator Conrad?

Senator CONRAD. Thank you, Mr. Chairman.

Welcome, Mr. Lujan.

Could you tell me what you see as the critical issues that this committee must resolve on either side of the dispute? In other words, if you were looking at this as somebody that was trying to make up their mind, and had not yet decided which way one ought to vote on this matter, what would you see as the critical issues on both sides of the controversy?

Secretary LUJAN. Well, I think there is only one issue that you have to consider, and that is whether we can have development in ANWR in an environmentally acceptable manner. I think that is the big issue.

If you determine that yourself, then you would agree that this legislation should be passed, and that we should go ahead with exploration in ANWR.

Senator CONRAD. Can you give me what you see to be the strongest arguments for and against?

Secretary LUJAN. Probably for would be that we are importing about 50 percent of our oil, and it is going to get worse than that.

Another argument in favor would probably be the national security. It is always better to have your own oil than to have to bring it across the sea. I think those are the two big arguments for it.

Mr. CASON. I think there is one other major argument for it. This is the most promising area in the United States that we can possibly go to discover new oil resources.

Senator CONRAD. Let me just follow this up, before I go, and ask you to give the strongest argument as you see it against going forward.

But let me pursue this other question.

I have had people say to me, in my home State, which is a major energy State, Look, does not it make sense for us to be using up foreign sources before we use up all of our own? And would it not be wise to treat this as some sort of strategic reserve, and wait until oil is even more precious than it is now?

How would you respond to that argument?

Secretary LUJAN. Well, first of all, what we are doing here is first of all wanting to explore in ANWR to see if we have oil.

What you say about saving that oil for the future, we first have to determine whether there is any oil there or not, and how can you determine that without doing some exploration?

Mr. CASON. I think the principal issue there is the discovery of options. As we testified earlier, we are in the situation that if you discover that in fact there is oil in ANWR in commercial quantities, it will take us at least 10 years to bring it on market, and if we remember back to the oil embargoes of 1973 and the late 1970s, if we had waited until we had an oil embargo, and we had a crisis, to say, "Now is the time to make a decision", we still would not be able to bring it on line for another 10 years.

So, the issue right now is one of preparedness, where we know that we are importing 50 percent of our oil. Our reserve base is in a manner right now that we expect that to get worse, and if we have an exploration program now to discover whether we have the resources in place, we are in a much better position to determine how to produce those resources if we end up in a time of crisis.

Senator CONRAD. Could I just conclude?

Could you give me what you see as the strongest argument against going forward?

Secretary LUJAN. Well, it is that you would really damage the environment, and I think that the bill calls—well, that is the strongest argument.

The antidote to that is that the bill calls for all kinds of measures so that we do not damage the environment.

Senator CONRAD. I just have read the New York Times article that makes a series of assertions in terms of damage, and I do think that it is important that we get the most credible information that we can get on these questions.

So I, too, would urge you to do whatever you can through your good offices to provide us with the report, and hopefully one that is approved and official.

Secretary LUJAN. Let me say this—I only read that first paragraph. Senator Murkowski showed it to me as we were coming into the meeting—and it said that it is an unpublished report, and that is kind of like an unsigned letter that somebody sends you, complaining about someone.

Senator CONRAD. That is why I say that I hope we could get it approved—make whatever alterations they need to get it approved and get an official version that we could rely upon.

Secretary LUJAN. Thank you, Senator.

The CHAIRMAN. Senator Domenici?

Senator DOMENICI. Let me just say to the Chairman that I am only going to take a couple of minutes, and Mr. Secretary, let me suggest to you that in the scheme of things, I think it worked out exactly right that your first public presentation is this one.

We are going to talk about a lot of issues in the Department of Interior, and we are going to talk about a lot of issues in the Department of Energy, but frankly, you are here on the most important energy issue confronting the United States.

Not ANWR per se, but America's growing dependence. People in our country never respond until there is a crisis. But we hear a lot of things about our balance of trade deficit. How are we going to ever solve that? Right now, $40 billion of the trade deficit is directed toward oil and related products.

That means that if we were to go back to the day when all other products were producing zero deficit, we would still have $40 billion a year going toward this product—oil or related products. And it is growing.

And for all of the talk about how to solve the problem, nobody knows how, in the foreseeable future, to get the United States off of oil as the energy that drives the economic machinery of this country.

The world is producing a lot of it, but we are not. We use a lot of it, and we do not have it, so it seems to me that every other issue pales from the standpoint of peace and war, and prosperity—every other one pales when you come to testifying about America's energy dependence.

In a sense, I think that is why you are here. That is why the President that you represent has said, if it is American owned, and if we can do it, and we find out we own a substantial amount of oil we ought to proceed, with whatever safeguards are traditional in the United States for a pristine environment.

So, I think you are here because that is the issue. I hope that you perceive it to be the issue.

My question is, has anything changed since we concluded hearings last year on ANWR, that you are aware of?

Secretary LUJAN. Probably the importation of foreign oil has grown.

Senator DOMENICI. So that if anything has changed, the urgency for proceeding to find out whether we can grow a little bit less dependent has grown more severe with regard to the environment, however, estimates of what is there together with plans as to how

you would proceed to protect and yet explore have not changed. There is no significant change that you are aware of in this area, is that right, Mr. Secretary?

Secretary LUJAN That is correct.

Senator DOMENICI. Thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Domenici.

Senator Bingaman?

Senator BINGAMAN. Thank you, Mr. Chairman.

Do you anticipate having a witness from the Department of Energy as a part of this hearing, or one of these hearings?

The CHAIRMAN. Admiral Watkins is submitting a statement.

Senator BINGAMAN. But there will be no witness to testify?

The CHAIRMAN. No. Frankly, Admiral Watkins' statement, since he does not oversee this, would be mainly on the question of need, and he is so busy trying to clean up that nuclear waste, we wanted to try to lighten his burden of testifying here.

But if the committee wants to, we could certainly invite him in person.

Senator BINGAMAN. Mr. Secretary, let me welcome you again to the committee, and ask about a couple of things that you say in your statement.

One item—and maybe this was covered in your direct testimony, and I apologize for not being here for all of that—but you say that the administration has several concerns regarding the permanent appropriation and reclamation fund futures of the bill, and indicate there—the language you use is that the bill would make the balance of the account—this is the 25, the other 15 percent, I guess it is—the balance of the account available without further appropriation for Federal recreational land acquisition purposes.

This would create an automatic, uncontrolled spending program for recreational land acquisition. That could total several hundred million dollars over the leasing period.

I would just ask—I am wondering what the extent of your concern, and the administration's concern, is, in this regard? Is this a fatal flaw in the bill, as you see it?

Secretary LUJAN. Well, we feel it is a flaw.

We feel that the way to handle acquisitions is through the appropriations process, rather than to mandate it. You know, an automatic amount going for that purpose every year.

Senator BINGAMAN. But you are not prepared—you are not suggesting that the administration would consider a veto on this basis?

Secretary LUJAN. Never say never.

Senator BINGAMAN. You also indicate over here that your view that the Federal revenues from the development should go to the Treasury, where they can serve the taxpayer, and fund national priorities through the budget process, and urged the committee to reconsider the provisions of Title V.

Is it your view that all of the revenues from the development should go to the Treasury?

Secretary LUJAN. Yes, we believe that. You know, there are different needs. There are all kinds of needs for that money, and if it comes into the general treasury, then we can better—working with the Congress—prioritize what we are going to use that money for.

Senator BINGAMAN. You do not object to the funds that the bill contemplates going to the State of Alaska?

Secretary LUJAN. Yes, I do.

Senator BINGAMAN. You object to that, too? You think that all of that should come to the Federal Treasury?

Secretary LUJAN. Yes, I do.

Senator MURKOWSKI. Wait a minute, I heard that. [Laughter.]

Senator BINGAMAN. This may be a better bill than I thought. [Laughter.]

You also discuss section 203(c) over here, which prohibits the Secretary from offering more than 300,000 acres in the first lease-sale, indicating that that, in your view, is excessively burdensome.

That is 20 percent that would be offered in the first lease-sale. It does not strike me that that is an excessively small amount to go in the first lease-sale.

I guess that I would like your elaboration on that, as to what you see as the major problem there.

Secretary LUJAN. Well, part of the method that we propose for controlling environmental damage is that we consolidate facilities. And if we are looking at limiting the amount that we are going to offer for lease, and do it piecemeal, then of course you are going to have to have some facilities for this particular amount that you let, and then as you go on, if you just leave it up to the Secretary, we can lease it in an acceptable manner.

But it gives us the opportunity to plan it, and how we are going to consolidate the facilities for less environmental damage.

Senator BINGAMAN. You make a couple of statements also about the commitment of the administration to developing alternative energy sources as conservation—let me just state a concern that I have had, that you may have shared.

I guess the concern is that as I have seen dependence on foreign sources grow, we have seen, really, a shutdown in exploration and development activity in the lower 48, and a substantial shifting of resources by many of the major companies out of the United States—exploration resources—to foreign sites, for development of oil.

Is there anything the administration would propose to do, to try to counter that? Or is that something that just goes forward without any ability to deal with it?

Secretary LUJAN. No, we have the ability, and the President has proposals that will remove a lot of the burdensome regulations, so that we can bring drilling back into this country.

Maybe Mr. Cason would have some comments.

Mr. CASON. One of the things that we have just recently done, Senator, is that we have taken action on our rental rates for onshore oil and gas leases.

One of the things that would drive people off the Federal properties is the cost of carrying property in inventory before they have a chance to explore and develop. One of the actions that the Department has taken recently is to reduce those carrying costs on the rental rates, and that is done with the proviso that if circumstances change to make it more attractive, and the market improves, that the secretary can undo that with a 90-day notice to lessees.

In addition, the Department took action last year and the year before that to allow suspension of stripper wells, such that people were not forced to plug their wells prematurely in a poor market. Essentially, many of the things that cause this kind of impact right now is the state of the market.

It has gone down far enough that the list costs are too expensive where we are at, and the prospects are too small to be encouraging to the industry. And I think once the market improves, we will be in a better situation there.

Senator BINGAMAN. Do you believe, as I guess I do, that development, additional significant investment in developing oil and gas resources in the lower 48, will not occur unless we do something to stabilize the price of oil with an import fee of some kind?

Secretary LUJAN. Well, I do not know that I would go into the import fee for the administration, but they have to stabilize. You are correct.

Senator BINGAMAN. How could we possibly stabilize it, if we do not do something like a minimum fee on imported oil, or something—that something that would keep us from riding the peaks and valleys of world price?

Secretary LUJAN. As you know, the administration does not support the $5. But the other way, you can bring more money in, to raise it, or you can reduce the cost of doing business. And that is by doing away with some of those burdensome regulations—lowering the cost of doing business. And so that is another way that one can do it.

Mr. CASON. I think one of the concerns there, with the oil import fee, is the past studies have indicated that economically the country as a whole ends up paying a bigger price with the import fee than it does without it, and the artificial intrusion of the market is something that gives people a lot of concern. I am sure it is going to be one of the things that gets re-evaluated again during this administration, but that is a past view on it.

Senator BINGAMAN. That is all I have right now, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Bingaman.

Senator Burns?

Senator BURNS. Thank you, Mr. Chairman, and good morning, Mr. Secretary.

I just have a couple of questions. I guess I am most sensitive in the area of exploration for new resources, from a security standpoint for this nation.

Maybe I should be directing these questions to the Secretary of Energy rather than you, because your main area is dealing with the environment.

In any case, how does the ANWR fit into our nation's energy mix?

Secretary LUJAN. Well, since we import so much oil, that will be—ANWR will displace the amount of oil that we import.

We expect it to be one of the largest fields. There was testimony a little while ago that at an average, if we just get a 3.2 billion barrels of oil, that that will amount to 2 percent of our total amount of available oil, that we have.

But there is some indication that it could be as high as 10 billion barrels—that is the high figure—and that is 3 billion is 2 percent,

then 10 billion would be in the area of 6 percent. And so it is substantial.

Senator BURNS. When I read the estimates relative to the chances of the development being of commercial value, there is about in 5 to 1 chance it will be successful most oil companies, or most explorers—let us put it that way—if they get their estimate down to a 50 in 1 chance of a well coming in, they considers that a pretty good opportunity.

I do not go to the track very often, but I like that 5 to 1 chance a little better than I like at 50 to 1 chance.

Mr. Secretary, considered all of the public living issues, or any other area in the continental United States, where do we go, if we do not open ANWR?

Secretary LUJAN. Well, there are other places with oil. But we need to get those, in addition to ANWR, in addition to the conservation, to the alternative fuels—we have to do all of those things. We cannot just depend upon one, and just shut off the option of 2 to 6 percent of the oil that we need.

Senator BURNS. I gather from what you are saying, we are dependent on fossil fuels and if ANWR is not opened up, we are limited to only the other fields that may be available. This situation will not begin to resolve our needs.

Secretary LUJAN. Well, we can go to coal. That has got problems with it. We can go to nuclear—that is got some problems. We can go to just almost any other kind of things to replace that production, but it has all got problems.

Nothing comes easy, Senator.

Senator BURNS. Amen.

I have no further questions, Mr. Chairman.

The CHAIRMAN. Senator Rockefeller?

Senator ROCKEFELLER. Thank you, Mr. Chairman.

I apologize for being late, and I might say that I am among those—I do not know how many there are—on the committee who are undecided on this issue. And I see problems on both sides.

I understand the energy import problem, in fact, under two days, I believe today if you take imported oil, Japan, Taiwan and Korea, and you add up the bilateral trade deficits with the last three, and the deficit with the first one, you have about 90 percent of our trade deficit.

And of course, today we are importing 45 percent. It is probably going to be 65 or 70 percent within the next 10 years, and I understand that.

I also understand that those who oppose this would say that in pristine territories, areas that once there has been activity there, it is no longer pristine, and that represents kind of a classical dilemma that we face in West Virginia, and that is faced here, in this situation.

And it is just a classical dilemma, so that what you have is—I suppose you have four choices, or several.

You could take no action—the Congress could take no action. We could go ahead and designate the area as wilderness, and not do anything with it. Or we could permit energy leasing in the 1002 area.

I would hope that we would either designate wilderness, or we would commit to the energy leasing, and that we would not fool around with anything else. We would just simply decide, and not come back on this issue anymore.

Now, during your confirmation hearing, Secretary Lujan, you stated that you were not in favor of land exchanges. Is that still your position?

Secretary LUJAN. Yes, sir.

Senator ROCKEFELLER. The final legislative environmental impact statement sent to Congress by your department recommended that the entire 1.5 million acres, Coastal Plain area, be opened to oil and gas leasing.

Does this include the calving area for the Porcupine Caribou herd?

Secretary LUJAN. Yes, it does.

Senator ROCKEFELLER. Well, when I met with the Governor of Alaska, the other day, he expressed concern about this. He said that that was a problem for him. He said studies over the last 15 years, more or less, show that calving takes place in certain areas. He indicated that could be adjusted to, but he said basically it stays in the same area—and he is the Governor of Alaska, and this was the main concern that he brought to me.

Now, as Secretary of Interior, I believe that this legislation—and I am not clear on this—gives you the authority to exclude certain areas from development, if they are deemed to be of particular environmental sensitivity—is that correct?

Secretary LUJAN. Yes, sir, that is correct.

Senator ROCKEFELLER. If it appears that caribou are being harmed, as a result of exploration, drilling, or whatever, would you exercise or will you exercise that authority to prevent calving problems?

Secretary LUJAN. Yes, and we will look at that very, very carefully, Senator.

I think that is part of my responsibility to balance out the two competing interests.

Senator ROCKEFELLER. My only other question is, there seems to be a lot of concern that Alaska is having to do this monitoring all by itself, and that they are no longer the rich State that they once were, and that they are a poor state, relative to their prior condition, and they do not have the people to put out there to monitor.

There have been complaints—in fact, there was a complaint from the Governor, saying that they have to do it kind of by themselves, and that EPA does not have anybody out there, and that the monitoring is therefore insufficient on an overall basis.

Is there a way out of that?

Secretary LUJAN. Well, there is a big difference.

We are talking about ANWR here, which is Federal land, and Prudhoe Bay, which is State land. And so, I can tell you this: that as far as ANWR is concerned, and that that is a Federal responsibility, there will be Federal monitoring on it.

Senator ROCKEFELLER. And how can you say that, sir, if I think the monitoring would come from EPA, would it not? Or would it be your people?

Secretary LUJAN. Yes, and we would be looking at it, too, because we have some responsibilities there.

You just mentioned that the Secretary of Interior has the authority to stop development any place that seems to be threatened. So we need to know whether it is threatened or not, and so we will be there to take a look at it.

Ms. LAMSON. Senator, I would just make a comment to keep in mind—this still will be a National Wildlife Refuge, even if the area is opened for oil and gas leasing.

So, the Department would have a decided responsibility for monitoring and enforcement, and it still remains a refuge.

Senator ROCKEFELLER. Thank you, Mr. Secretary.

Thank you, Mr. Chairman.

Senator WIRTH. Would the Senator yield?

Senator ROCKEFELLER. Yes.

Senator WIRTH. Just on a question of what kind of checks exist in this, to make sure we understand that—once the leasing goes forward, what ability do you have—say, if there is harm, following Senator Rockefeller's question, say, to the calving areas of the caribou, what can you do?

Secretary LUJAN. We can shut it down, according to the bill. We have got the authority to shut it down, any time that I think something——

Senator WIRTH. Would that break the contact? Would you be able to do the leases?

Secretary LUJAN. Yes. It certainly does. It is pretty tough.

Senator WIRTH. But the lease is effectively a contract, is that right?

Mr. CASON. Yes. There is a provision in the bill.

Senator WIRTH. I am just curious—what happens? I mean, it sounds good to say we are going to protect that, we will go in and defend against it. But how does that happen? Is there a legal procedure that is gone through? Do you do that with just unilaterally—and say that that is a bad thing to do?

Secretary LUJAN. I think I can.

Let me read that section to you, because I think I can do that.

It says, "If at any time while our duties are being carried out under a plan approved by this section—'and that is the leasing section—"the Secretary, on the basis on information, determines that the continuation of any particular activity under the plan is likely to result in significant adverse effect on fish or wildlife, their habitat, environment, and so on and so forth, the Secretary, after consultation with the lessee, shall:

(1) Make modifications"—and then it goes on.

(2) Temporarily suspend, and

(3) Terminate, and cancel the plan, where actions under 1 and 2 will not stop the adverse effect.

Senator WIRTH. Do you have to buy out the lessee if that happens?

Secretary LUJAN. No, there is a place here where, in the bill, that tells me exactly—we have got to give them their money back, what they have put into it.

Cancellation shall entitle the lessee to receive such compensation as the lessee demonstrates to the Secretary to be equal to the

excess in over of the lessee's revenues from the lease, plus interest. They get their money back, basically.

Ms. LAMSON. Senator, I would like to add that before you even get to the point of environmental damage, that this bill calls for, and the Department has testified in the past, that through each stage of the process, we would be complying with the NEPA, so that there would be site-specific studies conducted to determine how activities may or may not affect the resources, and to what degree.

So, we would hope that we would be able to identify any potential risks before any action is taken.

The CHAIRMAN. Section 208 deals with lease suspension. The Secretary is authorized to suspend the lease where it would, among other things, be a threat of adverse effect on fish and wildlife.

Senator Heflin?

Senator HEFLIN. I will submit my statement for the record.

STATEMENT OF HON. HOWELL T. HEFLIN, U.S. SENATOR FROM ALABAMA

Mr. Chairman, last year, I was a cosponsor of similar legislation, S. 1217. I plan to cosponsor S. 406 this year because I believe that it will open the Coastal Plain of ANWR to environmentally sound domestic oil and gas activities.

Mr. Chairman, I would like to re-emphasize my position regarding the proposed leasing, exploration and development of ANWR. I believe that we can take the appropriate steps to ensure the right balance between our national security and environmental issues.

It is my understanding that those opposing S. 406 are afraid that oil development would seriously damage a unique and invaluable Arctic ecosystem and wilderness area. On the other hand, we, who favor development, envision the Coastal Plain of ANWR as the nation's most promising remaining area for finding very significant oil fields. We also believe that the oil industry can explore and develop ANWR without significantly compromising its environmental and wilderness values.

In reaching our decision whether to open up 1.5 million acres of the Coastal Plain of ANWR, I hope that we will weigh very carefully the benefits of opening up an area which, purportedly, is the "best single opportunity to increase significantly domestic oil production", versus the risks of adversely affecting "the most biologically productive part of the Arctic Refuge for wildlife."

In my judgment, congressionally mandated "phased", competitive leasing, coupled with congressionally imposed strict environmental standards and requirements that exploration and development and production be performed in a manner consistent with fish, wildlife, and their habitat, will allow the Secretary of DOI and the Congress to monitor very closely the Coastal Plain with very little environmental harm.

With our domestic petroleum reserves steadily declining, and with DOI estimate of 3.2 billion barrels of oil in one field of the Coastal Plain, I believe that a sound national energy policy would compel us to open up the approximately 15,000 acres-less than 1%—of the Coastal Plain.

Thank you.

Senator HEFLIN. Somewhat along the same area, as I understand it, the bill authorizes the Secretary of Interior to exclude leasing activities in areas considered particularly environmentally sensitive, which includes the question of whether or not you are going to lease, and that includes the suspension of the lease agreement and the cancellation of the lease agreement.

Now, what would be—well, I will ask you this. Is that subject to any review, or should it be subject to a review?

Secretary LUJAN. Yes, sir. I think a point needs to be made here, that Ms. Lamson raised, and I think that we need to be very, very specific, because that will answer a lot of questions that many of the members have had.

The report that we gave to Congress was something that you asked for, how one could proceed. But it also calls for, before we do anything, even before we think of leasing, we start to put it up for bid—we have to do everything that NEPA asks us to do.

Then, at each step, when you lease, each time, you will have what is required under NEPA, so that even before drilling, we have this study, and that will tell me, as Secretary, which areas are very environmentally sensitive, so that I can completely exclude them.

Senator HEFLIN. Well, that would include the trail, the habitat of migratory animals, such as the caribou. You will know that their trails, from a historical basis, and you make determinations pertaining to whether or not that in effect has a significant adverse impact if leasing were to occur, pertaining to them.

Secretary LUJAN. Yes, sir, absolutely.

Senator HEFLIN. All right.

Now, I ask you about reviews. Down the road, it could be that you might get a person that did not feel very strongly towards the environment, or on the other hand, that might feel exceptionally strong for the environment—a zealot, one way or the other.

What provisions should be provided for, for some type of an appeal, to protect against one way zealots or the other way zealots?

Secretary LUJAN. Well, there is always the courts, that if I start some kind of an action, they can always take me to court, as not within the scope of my authority, or that I did not take certain things into consideration. That happens every day.

So, while I have all kinds of authority to stop it, somebody can take me to court, on either side.

Senator HEFLIN. Well, should there be some type of a definition, or some aspect of what is and what is not significant, or adverse, environmental impact, or words that would be used in it?

I mean, you have got to have some sort of a just not left completely to the discretion, but there ought to be—and we are government of laws, rather than—I mean, by the rule of law, it prevails, as opposed to the rule of man.

Secretary LUJAN. You are absolutely correct.

Senator HEFLIN. What type of provisions should be provided for the guidance of the Secretary of Interior in complying with this? And what should be placed in it, in regards to guidelines for courts to have to review it?

I think from your viewpoint, and if you were the Secretary, in two years, or four years, or eight years, or whatever it might be from now, you would want to have some sort of established guidelines, to give you guidance, relative to how you make your decision.

Secretary LUJAN. You are absolutely correct, and as a matter of fact, one of the things that we are objecting to is the fact that there is no real definition of what significant adverse impact is.

And I think you are absolutely correct. I agree with you 100 percent, that we should go in that direction of defining what it is.

Senator HEFLIN. What percentage of our oil today do we get from what we would put in quotes "foreign sources"?

Secretary LUJAN. About 50 percent.

Senator HEFLIN. Then we have increased some. What percentage of the oil that we consume in America today is dependent from sources under the control of OPEC nations?

Secretary LUJAN. Controlled by OPEC, it is 20 percent.

Senator HEFLIN. Now, how many of those OPEC nations are Western Hemisphere nations? If you were to exclude the Western Hemisphere countries from OPEC, what percentage would be——

Secretary LUJAN. I do not know. It would be less than 20 percent.

Senator HEFLIN. Well, that is rather obvious.

Secretary LUJAN. Let me check that, and I will supply that for the record.

[The information follows:]

The American Petroleum Institute (API) recently reported that imports of crude oil and petroleum products were 20 percent higher than the same month a year ago, which would make them about 50 percent of exports on a gross basis. However, annual statistics on net imports tend to be more indicative of import dependence than monthly data on gross imports. Net oil imports as a percentage of actual consumption have risen from a low of 27 percent in 1985 to the current 37 percent. That 37 percent net import level was based on net imports of 6.4 million barrels per day and consumption of 17.2 million barrels per day. This includes net imports equal to 20 percent of total consumption from OPEC. OPEC members in the Western Hemisphere, Venezuela and Ecuador, provided net imports of 5 percent of total consumption.

Senator HEFLIN. I would like to have those figures.

Secretary LUJAN. In other words, the question is how much from—not from Mexico and Venezuela, and those countries?

Senator HEFLIN. Yes.

Have you been to the ANWR area, and viewed it?

Secretary LUJAN. Yes, sir, I have been there twice.

Senator HEFLIN. What is the proposal? How much—I mean, there is a limit, as I recall it, in this bill, as to how much would be leased, at least initially.

What is it?

Secretary LUJAN. Yes, sir, there is. In the whole ANWR Arctic National Wildlife Refuge, there is 19 million acres. Of that 19, we are talking about leasing out 1.5 out of the entire 19—million, that is.

Senator HEFLIN. Percentagewise, that is what?

Secretary LUJAN. One-twentieth.

Senator HEFLIN. That is all I have.

The CHAIRMAN. Thank you very much, Senator Heflin.

Mr. Secretary, thank you very much.

Senator MCCONNELL. Excuse me, Mr. Chairman, if I may?

The CHAIRMAN. Excuse me, Senator McConnell. You have been so courteous over there.

Senator McConnell?

Senator MCCONNELL. Mr. Secretary, I noticed with interest and approval your references on page 6 of your statement as to strides in clean coal technology, and the feeling that this country is going to use more coal.

I commend you for that, and I certainly hope that is the case. My few questions will relate to coal.

Has any study or analysis been conducted on the impact of increased supplies of oil from ANWR on the U.S. coal industry?

Mr. CASON. I do not know if any study directly, but it probably will not have much impact, because we compete in different markets. Generally, the oil is used in the transportation sector in the

United States, and most of the coal is transmitted into electrical-type capabilities.

Senator MCCONNELL. I know that, and that really, I think, is the answer to the second part of my question, which was, could you foresee any scenario under which this increased oil supply might lead to displacement of domestic coal?

Mr. CASON. No.

Secretary LUJAN. I do not believe so.

Senator MCCONNELL. I am aware there is a State-by-State analysis of the oil development dollar flow from the North Slope that has already been conducted.

That analysis indicates that Kentucky received about $12 million from those operations from the period of 1980 to 1986. Has a similar analysis been conducted of the potential dollar flow for States from the development of ANWR?

Mr. CASON. Not as far as I know.

Senator MCCONNELL. Can we assume that the dollar flow would be similar to that of the North Slope operation?

Mr. CASON. If you can make the assumption first that the suppliers of materials being used in ANWR would continue to be about the same, yes, you could make that assumption.

Principally, what their previous analysis was making an assessment of where the supplies and materials came from, that were used in Prudhoe Bay and the surrounding fields, and what resident States those supplies came from.

Senator MCCONNELL. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator WIRTH. Mr. Chairman, might I ask a couple of questions for the record?

The CHAIRMAN. If you could make it very short, because we have five witnesses and about an hour to deal with them.

Senator WIRTH. We also have a major issue here, Mr. Chairman.

I am not for purposes of delay, but it just seems to me that a number of things have come out that for the record we ought to include.

Number one, if you might, Mr. Lujan, in response to the question raised by Senator Heflin, you said that only 1.5 million out of 19 million acres were being up for lease.

Secretary LUJAN. That is right.

Senator WIRTH. Does that suggest that there are oil possibilities, you think, in the other 17.5 million acres?

Secretary LUJAN. No.

Senator WIRTH. I just want to point out that we are not saying that it is a tiny little bit. That is the only area that is potentially up for lease.

Second, on the budget issue, you project—and this is the Truth in Budgeting question—you project $2.1 billion would come in the next fiscal year's budget from this.

Does that assume the leasing of all 1.5 million acres?

Secretary LUJAN. No. As a matter of fact, I do not know that you would ever lease the entire 1.5 million acres.

Senator WIRTH. What is the assumption that gets you to $2.1 billion? Could you supply that to us for the record?

Secretary LUJAN. I will.

[The information follows:]

The $2.1 billion estimate is based on the present values and prospects of finding various quantities of economically recoverable oil given current estimates of:
Geologic risk and oil probability distributions.
An oil price in 2000 of $20–$40 per barrel, with a subsequent annual real increase of 2 percent.
A royalty of 12½ percent and an annual rental of $3 per acre.
Inflation of 4 percent annually.

Senator WIRTH. Second, could you supply to the record what the assumption is on the per-acre lease fee that would come to the government from that?

Secretary LUJAN. Yes, sir.

[The information follows:]

The per-acre bid varies by tract, depending on the tract's geologic prospects and distance to TAPS. It was assumed the minimum bid per acre is $300. The tract values range as high as $36,000 per acre.

Mr. CASON. That we will have to check on, Senator, because we need to keep that data very close. Assuming that when people actually——

Senator WIRTH. Let me just give you a ballpark. If you leased all 1.5 million acres, that would mean that you would get about $1,400 per acre for the lease, for the whole deal.

I mean, if you just use long division, that is $1,400 an acre per lease.

Now, on the North Slope of Alaska, it is my understanding that the average high bids have been in the neighborhood of—the average—have been in the average of $150 an acre. And you are assuming for this that we will get more than ten times the amount of the average high lease—and there have never been any over $500 an acre.

Is that right?

Secretary LUJAN. Well, the figures that I have in mind, just off the top of my head—it is $600 million for bonus, and 1.5 rent, is that it?

Mr. CASON. No.

Senator WIRTH. Maybe you could supply that for the record.

Mr. Chairman, I think you were raising questions about the budget. You know, this is specious at best, but maybe you could tell us, give us, Mr. Secretary, how many acres you think would be leased of the 1.5 million?

Second, what the average lease cost would be, and third, on that basis, to get to the $2.1 billion, and third, what the history of leases have been up there? Does that even approach the average? I do not think it comes anywhere near close.

And finally, if you could supply us for the record, Mr. Secretary, your rationale for opening ANWR, stated a number of times, was energy security.

You said that on a number of occasions, that our imports are now 50 percent, and national security issues, and so on. But could you give us the Adminstration's overall energy policy or your description of that, in terms of how we are going to get at this energy security issue?

If that is the number one problem that you all see we face—and it is a very legitimate issue, I agree with that—would you give us a

description of what the administration's policy is in terms of breaking into this energy security cycle? Certainly there are other policies the administration must be pursuing other than ANWR, which gets at, by your numbers, 2 to 6 percent of the overall problem.

Certainly there are other areas, and I think that we ought to have a sense of where ANWR fits into the overall agenda.

If you could provide that for the record, that would be helpful, too.

Secretary LUJAN. Where does it fit?

Senator WIRTH. If the overall problem is that your—by your testimony today, the number one problem is energy security, and that is the rationale for drilling in ANWR. Then there must be other policies that the administration is pursuing as well, to make us less energy dependent, and to strength our energy security.

If we could get the administration's policy on that, I think that would be helpful to all of us.

Secretary LUJAN. Fine.

[The information follows:]

The energy security issue has to do with an excessive reliance on foreign imports. In addition to exacerbating the trade deficit, an excessive reliance on imported oil leaves the U.S. vulnerable to manipulation of the oil market by the dominant world oil producers. There are ways to attack this problem: reduce the demand for oil and increase the domestic supply of oil. Demand may be reduced by switching to alternate forms of energy and by energy conservation. Oil production in the U.S. has been and will probably continue to decline. The North Slope provides one quarter of domestic oil, but Prudhoe Bay is expected to start declining in 1990. This decline cannot be offset by other discovered North Slope fields. ANWR has the potential to offset this decline in North Slope production. While it cannot solve the problem alone, the potential ANWR production could delay complete dominance by imported oil until other alternatives have a chance to develop. But even ANWR will take time—it will probably take at least 10 years from the start of a leasing program before ANWR will be ready to produce. In summary, no one solution can solve the problem, and ANWR is only one facet of a mutli-pronged policy.

The typical lease is assumed to be 2560 acres. The per-acre cost ranges from $300 to about $36,000. For the tracts assumed to be in the 200,000 acres sold for $2.1 billion, the average cost per acre is $10,500. Thus the average lease cost will be $26,880,000.

The history of leasing on the North Slope has demonstrated the wide variability that can occur in oil and gas leasing. The State sale in 1965 in the Prudhoe Bay area was the first primarily North Slope lease sale. Over 400,000 acres were leased at an average of $15 per acre. The State leased another 42,000 acres in 1967 at an average of $35 per acre. Then the Prudhoe Bay discovery was announced in 1968. In 1969 the State leased over 412,000 acres at an average of $2,182 per acre. No further leasing occurred until the joint State-Federal Beaufort Sea sale in 1979. Additional State sales all averaged less than $100 per acre (one as low as $3 per acre), until the June, 1988 sale which averaged $150 per acre. Federal NPRA showed similarly poor results. Additional Beaufort Sea sales were much stronger with sales averaging $573, $3,119, $726 and $107 per acre. The last three were Federal sales in which a total of almost 3 million acres were leased.

It was assumed that 200,000 acres will be leased in the first sale. This also assumes that the bidders have at least 300,000 acres of the best initially available prospects to bid on. The selection of tracts was based on the estimated values and trends exhbibited by industry in OCS lease sales and other expressions of industry interest.

Senator WIRTH. Thank you, Mr. Chairman.

Thank you, Mr. Secretary.

Senator MURKOWSKI. Mr. Chairman?

The CHAIRMAN. Gentlemen, we have got five witnesses, but I do not want to cut you off.

Senator MURKOWSKI. I will be very, very brief, I promise you, Mr. Chairman.

I would like to enter into the record three editorials, one from the Washington Post, Wall Street Journal and New York Times, supporting the opening of ANWR.

The CHAIRMAN. Without objection.

[The articles follow:]

THE WASHINGTON POST, THURSDAY, APRIL 23, 1987 (P A22)

Caribou vs. Motorist

IT'S THE CARIBOU versus the motorist, again. Secretary of the Interior Donald P. Hodel has recommended opening part of the Arctic National Wildlife Refuge in Alaska to oil drilling. That was what the oil companies hoped he might do. A predictable shriek has gone up from the defenders of the refuge. The decision is up to Congress.

Environmental quarrels always seem to generate billowing exaggeration. Another major oil discovery in Alaska would certainly be convenient, postponing the effects of the decline in Prudhoe Bay production that the government expects within the next year or so. But it's not quite so vital as Secretary Hodel suggests. With or without more Alaskan wells, oil production in this country is likely to stay on a downward trend.

As for the caribou, however, oil drilling seems very unlikely to be the dire threat to them that their friends here in Washington claim. While the two cases are not entirely comparable, the Interior Department points out that the number of caribou around Prudhoe Bay, 60 miles west of the refuge, has tripled in the 19 years since oil operations began there. The aesthetic objections to oil drilling may be substantial, but the caribou do not seem to share them.

Preservation of wilderness is important, but much of Alaska is already under the strictest of preservation laws. The area that Mr. Hodel would open to drilling is 1.5 million acres, running about 100 miles along the state's north coast near the Canadian border. He points out that adjacent to it is an area five times as large that remains legally designated as wilderness, putting it off limits to any development whatever.

Human intrusion on the scale of oil exploration always makes a difference in a landscape. But that part of the arctic coast is one of the bleakest, most remote places on this continent, and there is hardly any other where drilling would have less impact on the surrounding life.

Drilling in the Arctic Refuge is not crucial to the country's future. But there is a respectable chance—about one in five, the department's geologists say—that exploration will find enough oil to be worth producing commercially. That oil could help ease the country's transition to lower oil supplies and, by a small but useful amount, reduce its dependence on uncertain imports. Congress would be right to go ahead and, with all the conditions and environmental precautions that apply to Prudhoe Bay, see what's under the refuge's tundra.

The Post

THE WALL STREET JOURNAL, WEDNESDAY, APRIL 22, 1987 (P.32)

The Caribou Crisis

No serious subject attracts more nonsense than energy. It happened in the 1970s when the government panicked itself into an "energy crisis," and it is happening again. Ronald Reagan's top energy officials are crying about "America's dependence on unstable sources of foreign oil" and "national security." The small saving grace of this phenomenon, however, is that it usually generates unintended comedy. This time it is Secretary of the Interior Don Hodel's fight with the caribou lobby.

On Monday Secretary Hodel recommended that Congress open to oil exploration 1.5 million acres along 104 miles of Alaska's coast on the Beaufort Sea (the only thing north of there is Santa Claus's home, the North Pole). The Interior Department estimates at least 600 million barrels and possibly as much as 9.2 billion barrels could be recovered. But environmental groups are asking, What about the threat to the Porcupine caribou herd? A representative of the Wilderness Society charged yesterday that "Hodel is simply ignoring and reversing the findings of the top 13 caribou researchers in North America, who came together and affirmed the importance of the core-calving area."

Perhaps only in Washington would you find people with the inclination or time to argue at length about holding up exploration for 600 million barrels of oil to save a "core-calving area." Not that everyone outside Washington can escape this nonsense. Environmentalism's left wing imposed 55-miles-per-hour speed limits and teensy-weensy cars on the nation. We take little comfort, then, in now seeing a conservative administration pushing its own nutty energy ideas as a way to obtain tax breaks for oil firms.

Opening up potential domestic U.S. oil reserves to exploration makes obvious sense. But why are Mr. Hodel and Secretary of Energy John Herrington trying to resurrect another "energy crisis"? Mr. Hodel has warned of lines at the gas pumps in "two to five years." Mr. Herrington recently warned that the U.S. could be importing half of its oil by the 1990s (up from 33% at present). This poses a "clear risk" for national security. So Mr. Herrington asked the White House to propose a 27.5% annual depletion allowance for new oil wells and wells using "enhanced-recovery" methods.

What's in fact happening is that since President Reagan fully decontrolled oil in January 1981, the price mechanism has functioned efficiently—but not in a way that pleases some U.S. oil producers and their Washington allies. Prices fell from nearly $40 a barrel. Prices have rebounded to about $18 a barrel, but oil lobbyists claim that prices aren't high enough to encourage new domestic exploration and development. So they want the federal government to intervene again—in the name of "national security."

The security warnings are a red herring. Given the amount of fuel available from Mexico, Canada and other nearby sources, it would be hard to imagine any oil threat that would put U.S. security at risk. It is indeed cheaper at this point to buy oil in the Middle East than it is to find it and pump it in the U.S. But that has been true for years. What we have learned in the 1980s is that oil-producing nations have a greater stake in selling their oil than the U.S. has in being able to buy it.

Messrs. Hodel and Herrington have advocated energy deregulation policies that are our best guarantee of plentiful energy. They should continue to do so, using whatever energy is left over to solve the caribou crisis.

THE NEW YORK TIMES, THURSDAY, APRIL 23, 1987 (P.A26)

In Alaska: Drill, but With Care

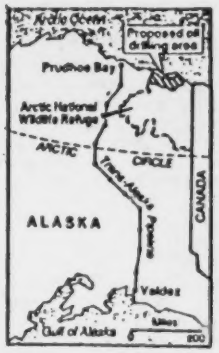
Alaska's Arctic National Wildlife Refuge is an untouched and fragile place that supports rare mammals and myriad species of birds. It is also the most promising untapped source of oil in North America. Should America drill for it?

What Congress decided, in 1980, was not to decide. It ordered a long study. The assessment is now in, and for Interior Secretary Hodel the decision isn't even close: leasing drilling rights to oil companies is "vital to our national security" because it "would reduce America's dependence on unstable sources of foreign oil."

Mr. Hodel is guilty of oversell. A single discovery can't save us from increasing dependence on Persian Gulf oil. But the potential economic benefit of development — perhaps tens of billions of dollars of oil — outweighs the risks. The unanswered question is whether environmentalists and developers can cooperate to minimize damage to the refuge.

The Interior Department estimates that between 600 million and 9.2 billion barrels of oil are recoverable from a 20-by-100-mile strip along the Arctic coast. But no matter how carefully done, development of the coastal strip would displace animals and scar land permanently. Tracks of vehicles that crossed the tundra decades ago are still visible. No one knows whether the caribou herd that bears its young near the coast would stop reproducing or simply move elsewhere.

Adversaries in this battle view development as ecological catastrophe or energy salvation. Outsiders can wonder why such apocalyptic fuss. An unusual environment would surely be damaged, but the amount of land involved is modest and the animals at risk are not endangered species. A lot of oil might be pumped, but probably not enough to keep America's motors running for an entire year. Ultimately, policy makers must weigh the dollar value of the oil against the intangible value of an unspoiled refuge.



The most likely net value of the oil, after accounting for costs and assuming a future world price of $33 a barrel, is about $15 billion. How much an untouched refuge is worth is anyone's guess — but it's hard to see how it could realistically be judged worth such an enormous sum. If America had an extra $15 billion to spend on wilderness protection, it wouldn't be spent on this one sliver of land.

That doesn't mean, however, that developers should be permitted to treat the refuge as another Bayonne. Elaborate, necessarily expensive precautions are needed to contain the disruption. Human and machine presence can and should be kept to a bare minimum until test wells are completed. Dense caribou calving grounds should be left alone until the animals' response to change is gauged.

A decade ago, precautions in the design and construction of the 1,000-mile-long Alaska pipeline saved the land from serious damage. If oil companies, government agencies and environmentalists approach the development of the refuge with comparable care, disaster should be avoidable.

Senator MURKOWSKI. Mr. Chairman, I would like to ask one question of the Secretary. If we cannot go ahead with OCS leasing in Alaska, where can we go ahead keeping in mind that the President has withdrawn one lease in Florida and two in California?

Secretary LUJAN. Well, we need to take a look at several places that we can proceed.

The withdrawal of the two California leases and the one in Florida does not mean that we are not going to do it there. What that means is that we are reviewing that whole situation, and we have to get back and give the President a report on whether we should and how we should and all of those things, in those three leases.

Senator MURKOWSKI. Last, Mr. Chairman, we are all aware of the area, called the Naval Petroleum Reserve number four, and the extensive exploration that went on at that location when the Department of the Navy leased it out to one of the major oil companies; 127 wells were drilled in the area immediately to the left of Prudhoe Bay.

It is a huge area, and it is my understanding that with the exception of some gas wells and some oil shale, there were no discoveries of commercial value. Since that time it was reverted back to its natural state.

Mr. CASON. That is essentially correct.

Senator MURKOWSKI. Can you give us an idea of the size of that area?

Mr. CASON. I do not know, off the top of my head.

It is very large.

Senator MURKOWSKI. It is in the millions of acres?

Mr. CASON. Yes.

Senator MURKOWSKI. It is over 10 million acres?

Mr. CASON. I would say that is correct.

Senator MURKOWSKI. And are you familiar with the compatibility of drilling on the Kenai Moose range in the Kenai Peninsula area. Has this refuge been in development for approximately 20 years ago?

Mr. CASON. I am not familiar with the refuge, but I am aware that we have wells in that area that have been producing for a long time.

Senator MURKOWSKI. I would appreciate it, Mr. Chairman, if the department of Interior could give us an update on compatibility of moose and the wells at that location. There may be some parallel to the caribou, the oil pipeline, and the Prudhoe Bay field.

Thank you, Mr. Chairman.

Senator WIRTH. Mr. Chairman, could we also get the Secretary to tell us, and give us the rationale, as to why the administration is reviewing the offshore drilling decisions in California and, Florida and not Alaska?

I know there are more electoral votes in California and Florida, and if they could submit that for the record, too—

[The information follows:]

There are several differences in the two issues. First, the ANWR issue is before the Congress and as such, it would not be the administration's choice to take this off the congressional agenda.

Second, it continues to be our position that the Administration and numerous organizations have provided Congress with enough information to make the basic deci-

sion on whether to proceed or not. We reiterate that there will be full NEPA compliance at each step in the process as we move forward.

Finally, as far as OCS goes, the resources both from an oil and gas standpoint and from an environmental standpoint are such that we do not have the base line of information on the areas that we have had because of the 1002 report, numerous hearings, numerous conferences and the continuing wealth of information from ongoing studies and reviews.

The CHAIRMAN. Thank you very much, Mr. Secretary. We appreciate your testimony.

Next we have a panel composed of Margaret A. Moran, Special Assistant for ANWR to the Governor of Alaska;

Lisa Speer, Senior Staff Scientist for the Natural Resources Defense Council of New York;

Brooks Yeager, Vice President for Governmental Relations of the National Audobon Society, stationed here in Washington;

Roger Herrera, Manager for Exploration and Lands of BP Exploration in Anchorage; and

Larry Morse, Field Manager for Prudhoe Bay, Lisburne Operation of ARCO Alaska, Inc., also in Anchorage.

Lisa Speer must leave, I am told, early, so if we may begin with Ms. Speer, of the Natural Resources Defense Council.

STATEMENT OF LISA SPEER, SENIOR STAFF SCIENTIST, NATURAL RESOURCES DEFENSE COUNCIL

Ms. SPEER. Thank you very much.

I apologize for having to leave early.

My name is Lisa Speer, and I am senior staff scientist with the Natural Resources Defense Council.

We welcome the opportunity to be here today to talk about S.406, which would open the Coastal Plain of the refuge to development.

I would like to ask that my statement be submitted for the record.

The CHAIRMAN. Without objection.

Ms. SPEER. Debate over S.406 and the fate of the Arctic National Wildlife Refuge——

The CHAIRMAN. Talk into the microphone, please.

Ms. SPEER. I am sorry—is one of the most important public lands and energy policy decisions facing this Congress.

A decision of this magnitude should not be made without a thorough understanding of the real risks and consequences of oil development in Arctic Alaska. With all due respect, we believe that these risks and consequences were not adequately addressed in the Department's 1002 report, nor have they been addressed since then.

Because of this, we submit that S.406 is premature. The absence of complete, accurate and objective information about the impacts of oil development in the Arctic has allowed the oil industry and others to perpetuate the myth that we can have both oil and essentially unharmed Arctic National Wildlife Refuge.

The idea that you can have your cake and eat it, that you can have oil and an essentially intact refuge is attractive, because it makes the decision easy. If it were only true, we could all go home to declare victory and retire, but unfortunately the evidence points elsewhere.

In the year since this committee voted to report S.2214, a much clearer picture of the consequences of massive oil development in the refuge has emerged.

Evidence of serious and long-lasting damage over the last year has punctured the myth that we can have oil and gas production without harming the environment.

Let me give you some examples that were mentioned earlier today. First, in May of 1988, the U.S. Fish and Wildlife Service released an assessment of the impacts of oil development on Prudhoe Bay's fish and wildlife. The Service's report chronicled the extensive loss of vegetation and habitat at Prudhoe, add concluded that most bird species in the area have declined in population, as have bear, wolves, and other predators.

The Fish and Wildlife Service report also detailed large gaps in our knowledge about the impacts of oil industry activities on the North Slope, and documented the failure of most attempts to mitigate those impacts.

Also in May of last year, new information about the impacts of gravel causeways near shore, close to water, came to light. After evaluating the available information, the U.S. Army Corps of Engineers at that time concluded that unacceptable environmental impacts to fisheries habitat have resulted from the Endicott causeway.

In October, EPA reached the same conclusion, stating that the causeways on the North Slope have degraded water quality and have placed commercial and subsistence fisheries at substantial risks.

EPA noted that declines in fish populations along the Beaufort Sea coast are likely, and that "it is possible that significant population declines have already begun to occur.'

In an unusual unanimity of opinion, the Alaska office of the Corps, EPA, and NMFS all agreed that solid fill gravel causeways posed an unacceptable threat to fisheries habitat. As a result, the Corps rejected Standard's applications to build a new gravel causeway to serve the Niakok field.

However, in a troubling triumph of politics over professionalism, the Corps, last month, rescinded its policy prohibiting new causeways, after heavy lobbying from the oil industry.

Finally, just yesterday, a draft report prepared by EPA came to light which documents serious instances of improper management of chemical and oil waste on the North Slope. This report describes chemical contamination of habitat, overflowing waste pits, oil waste seeping from drilling pads, stacks of leaking chemical drums, improper handling of hazardous material, and inadequate regulatory controls on oil industry waste.

Most of the incidents described in EPA's report occurred during 1988. Thus, the industry's assertions that major environmental violations are a thing of the past do not appear to be correct.

The incidents described by EPA also include those attributed to the major operators, thus casting doubt on industry contentions that oilfield service companies are the only problem on the North Slope.

Finally, the report documents the failure of State and Federal regulatory authorities to prevent chemical pollution and environ-

mental contamination at the oilfields, thus giving lie to the myth that the existing structure of laws and regulations are adequate to prevent significant environmental deterioration.

The Fish and Wildlife Service report information prepared by the Corps and EPA on causeways and the just-released EPA draft report make it clear that the impacts of major oil and gas development in the Arctic environment are significant, chronic, cumulative, and difficult or impossible to mitigate and prevent.

For reasons laid out in our written testimony, the environmental stipulations contained in S.406 will not appreciably change that fact.

In conclusion, this committee must make a choice. You can have oil, or you can have the nation's last intact sanctuary for Arctic wildlife. What you cannot have is both.

Thank you.

[The prepared statement of Ms. Speer follows:]

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Testimony of

Lisa Speer, Senior Staff Scientist

NATURAL RESOURCES DEFENSE COUNCIL

Before the

COMMITTEE ON ENERGY AND NATURAL RESOURCES

U.S. SENATE

on

S.406

A BILL TO AUTHORIZE OIL AND GAS LEASING AND DEVELOPMENT
ON THE COASTAL PLAIN OF THE ARCTIC NATIONAL WILDLIFE REFUGE

March 6, 1989

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Mr. Chairman and members of the Committee. My name is Lisa Speer. I am Senior Staff Scientist with the Natural Resources Defense Council, a national environmental organization with approximately 100,000 members and supporters nationwide. We welcome the opportunity to testify on S.406, which would open the coastal plain of the Arctic National Wildlife Refuge to oil and gas exploration and development.

I wish to emphasize at the outset that NRDC supports wilderness designation for the coastal plain of the Arctic Refuge. We therefore object to S.406 first and foremost because it allows oil development to proceed in the Refuge. However, even if one were favorably disposed towards oil development, which we are not, S.406 would not achieve its stated goal -- and the goal President Bush enunciated in his budget address to Congress last month -- of environmentally protective oil development. This is because:

1) devising effective requirements to protect the Refuge is impossible given the absence of complete and accurate information about the impacts of oil development in the Arctic and the ability of mitigation to reduce such impacts; and

2) S.406 fails for the most part to provide a level of protection equal to that provided in existing environmental statutes.

These issues and others are discussed in detail below.

I. AN INFORMED DECISION ON HOW TO PROCEED IN THE REFUGE IS IMPOSSIBLE GIVEN THE ABSENCE OF COMPLETE, ACCURATE AND OBJECTIVE INFORMATION ABOUT IMPACTS AND MITIGATION.

The decision on whether to allow oil and gas exploration and development in the coastal plain of the Arctic National Wildlife Refuge is one of the most important public lands and energy policy decisions facing the 101st Congress. This decision should not be made in the absence of complete, accurate and credible information. The Report to Congress issued by the Interior Department in 1987 (known as the "1002 Report") and the accompanying Legislative Environmental Impact Statement (LEIS) failed to provide a complete and accurate portrait of the impacts that can be expected to result from developing oil in the Refuge. As a result, the Report is an inadequate basis for Congressional decision making.[1] Some of the more important omissions from the 1002 Report, along with new impact information relevant to Congress' decision on the Refuge, are outlined below.

A. FLAWS IN THE REPORT TO CONGRESS/LEIS

1. Failure to Address Major Environmental Impacts

According to EPA, CRS and others, the 1002 Report failed to adequately evaluate whole classes of environmental effects associated with oil and gas development in the arctic, including air pollution, water pollution, solid and hazardous waste disposal, marine transportation facility impacts, and water and gravel consumption impacts.[2] The absence of information regarding these impacts in the Report to Congress makes an informed and reasoned choice by Congress among alternative courses of action impossible.

2. Underestimation of Impacts

For those impacts that were assessed in the Report/LEIS, serious questions have been raised regarding the accuracy of the analysis. According to EPA, "potential underestimation of impacts occurs throughout the LEIS."[3] EPA notes this especially true with respect to impacts on the Porcupine Caribou Herd due to the use of selectively chosen data. Moreover, the Department failed to consider an impact as major unless it lasted more than 30 years. "For many fish and wildlife species," EPA said, "several generations could be adversely affected within this time, leading to severe population and community level impacts."[4]

3. Failure to Consider Cumulative Impacts

Cumulative effects are those that result from the incremental impact of a proposed action when added to other past, present and reasonably foreseeable future actions. According to EPA. "cumulative effects are not adequately evaluated in the final LEIS."[5]

Cumulative impact assessment is particularly crucial for this area due to the extensive oil and gas development already taking place in the region. According to a recent analysis of cumulative landscape impacts resulting from existing oilfields in the Prudhoe Bay region,

> [c]umulative impacts are of particular concern in the ANWR because ... [a] vast complex of roads, pipelines and service centers stretching across the Arctic Coastal Plain could have unpredictable long-term impacts on the total function of the coastal plain ecosystem.[6]

Failure to evaluate these and other cumulative impacts constitutes one of the most serious flaws in the Report/LEIS.[7]

4. Failure to Evaluate the Effectiveness of Mitigating Measures

According to EPA, "the mitigation discussions in the final EIS are incomplete."[8] The final EIS assumes that mitigating measures will be completely successful at mitigating any impacts, but no analysis or references are provided to support those assumptions. Instead, the Report/LEIS points to the experience at Prudhoe Bay as the basis for concluding that adverse effects can be minimized or eliminated through the application of mitigating measures tested in that area. However, mitigation measures have not been employed at Prudhoe Bay to an extent sufficient to justify such a claim. In this regard, EPA has noted:

> [a]s the Corps of Engineers noted in its comments on the draft LEIS, industry has been reluctant to apply compensatory mitigation and restoration techniques on the North Slope, except in very limited experimental circumstances. EPA's own extensive experience with the major operators at Prudhoe Bay supports this conclusion; rehabilitation technology for the North Slope is particularly lacking.[9]

Just two months ago, the Corps reiterated that "[n]o one is sure ... just what practices would actually work as a means of 'restoration'."[10]

5. Failure to Consider Global Warming Impacts

Widespread concern has been expressed over the consequences of global warming -- a process thought to be greatly accelerated by the emission of carbon dioxide (CO_2) during combustion of fossil fuels. Combustion of a barrel of oil results in the emission of approximately 850 pounds of CO_2.[11] Combustion of the 3.2 billion barrels of oil the Department estimates lie under the coastal plain of the Refuge would pump 1.4 billion tons of CO_2 into the atmosphere, with potentially very serious, but unevaluated, consequences. By way of contrast, the total U.S. contribution of CO_2 to the atmosphere per year is 5.5 billion tons per year. (The world contribution is 25.3 billion tons/year). The effect of developing and consuming the oil thought to underlie the Refuge on global warming has never been addressed.

The Department has also failed to address the implications of global warming and attendant thawing of permafrost and sea level rise on infrastructure, waste injection wells and the hundreds of reserve pits containing toxic and other waste that the oil industry has constructed in the region.

B. NEW INFORMATION ON IMPACTS AT PRUDHOE BAY

Over the last year, critical new information about the impacts of oil development at Prudhoe Bay has surfaced. This information, which was not included in the Department's Final Report and LEIS, is relevant to Congressional consideration of development in the Arctic Refuge. It includes the following.

1. Impacts to Habitat and Wildlife

A U.S. Fish and Wildlife Service (FWS) assessment of the impacts of oil development at Prudhoe Bay on fish and wildlife was released in May of 1988.[12] This report documented extensive loss (11,000 acres) of vegetation, and concluded that most bird species in the area have declined in population, as have bears, wolves and other predators. The FWS report also detailed large gaps in our knowledge about the impacts of oil industry activities on the North Slope and documented the failure of most attempts to mitigate those impacts.

2. Causeways

In the last year, new information about the impacts of causeways on nearshore coastal waters and fish has come to light. In May of 1988, the Corps of Engineers concluded that "unacceptable environmental impacts to the fisheries habitat have resulted from the Endicott causeway."[13] In October of 1988 EPA concluded that causeways have degraded water quality and habitat in the Beaufort Sea, which in turn:

> ... place populations of anadromous fish, and the commercial and subsistence fisheries that rely upon them, at substantial risk. Indicators from causeway monitoring programs show that fish are being affected by these habitat changes; and it is possible that significant population declines have already begun to occur. (emphasis added).[14]

Last fall the Corps, supported by EPA and NMFS, implemented a "conditional" permit that rejected a proposed new gravel causeway similar to causeways that have caused unacceptable environmental impacts. However, after extensive lobbying by the oil industry, the Corps withdrew the permit last month and rescinded its policy that had effectively prohibited new causeways in the Beaufort Sea.[15]

3. Pollution

As described in detail in our report on the record of the oil industry on the North Slope,[16] operations at Prudhoe Bay generate massive amounts of pollutants. A recent study commissioned by the Alaska Department of Environmental Conservation and issued in

draft form last month estimates that each year oil and gas operations on the North Slope generate:[17]

- more than 90,000 barrels of RCRA hazardous waste;
- 5 million barrels of waste drilling mud and cuttings;
- 100 million barrels of produced water; and
- 27,000 tons of nitrogen oxides (NO_x).

Some of these pollutants have caused significant contamination. For example, in a study published last fall, U.S. Fish and Wildlife Service biologists found that sediment concentrations of chromium and lead in tundra ponds associated with reserve pits were in the range of those found near a metal plating factory outfall. When compared to ponds further from drill sites, tundra ponds adjacent to reserve pits were lower in abundance and diversity of aquatic invertebrates.[18]

4. Hazardous Materials

Hazardous materials handling continues to be a problem on the North Slope. EPA recently acknowledged uncertainty regarding whether hazardous waste generated by small support industries is being properly handled and disposed.[19]

Such materials can cause major impacts on wildlife. In September 1988, the FWS issued a Hazard Notice after a female polar bear was killed by improper handling of toxic materials.[20] According to the Notice:

> A most striking observation was that the remains of this bear were bright fluorescent pink, also the gravel under the bear and snow immediately adjacent to the bear were bright purple. Traces of urine and feces of foxes that had scavenged the carcass were also pink for a radius of at least 2 miles around the location of the dead bear. Although the organs critical for examination of most contaminants were missing by the time the bear was discovered, analysis of the snow and gravel confirmed the presence of runway dye -- Rhodamine-B and ethylene glycol.

The bear was known to have two yearling cubs in the summer of 1987. The Service concluded that, "even if her cubs did not contact the poison, their probability of survival in the absence of their mother is low. Therefore the likely loss from this incident is three polar bears." The Service went on to note that "the fates of any other animals that contacted the source of the ethylene glycol that killed the polar bear cannot be ascertained.

Other animals could have directly contacted the same source of contamination, and certainly many arctic foxes contacted the toxin secondarily by ingesting the flesh of the dead bear." FWS was unable to determine the source of the contamination.

5. Compliance Information

New compliance information has surfaced since NRDC presented its findings to this Committee on the poor record of compliance at Prudhoe Bay. Evidence of continuing compliance problems at Prudhoe include the following:

- Last year, EPA fined ARCO $80,000 for 43 violations of its effluent limits in discharges from ARCO's Kuparuk Seawater Treatment Plant.[21]

- In June 1988, NRDC filed suit against ARCO for more than 1,500 violations of ARCO's Clean Water Act permit governing discharges from a wastewater treatment plant at Prudhoe Bay and for discharging polluted water into North Slope wetlands without permits required by the Clean Water Act.

- 1988 compliance information compiled by the State indicates that violations involving oil spills and improper disposal of drilling waste, trash and hazardous materials on the North Slope continue to be a problem.[22]

C. A NEW REPORT TO CONGRESS/LEIS SHOULD BE PREPARED.

Based on the above considerations, 250 conservation organizations from around the country submitted an administrative petition to Secretary Lujan in January requesting that he commission the National Academy of Sciences to review information contained in the 1002 Report/LEIS. The petition requests that the National Academy of Sciences focus on:

- areas where relevant and important environmental, economic and geologic information exists but was not used by the Department in the Report to Congress/LEIS;

- missing baseline data and studies on impacts essential to an informed decision;

- inaccurate information, assumptions and analyses in the Report;

- alternative means of achieving any energy and economic benefits that may accrue from developing oil and gas in the Refuge.

Upon completion of the NAS review, we believe a revised Report to Congress/LEIS should be prepared that addresses the findings of the Academy and redresses the deficiencies outlined above and those raised by EPA, CRS, OTA and others. Such a revised LEIS is essential to a reasoned, rational debate over the future of the Arctic National Wildlife Refuge.

II. S.406 FAILS TO PROVIDE A LEVEL OF PROTECTION EQUAL TO THAT PROVIDED IN EXISTING ENVIRONMENTAL STATUTES.

As noted above, NRDC objects to S.406 first and foremost because it allows oil development in the Refuge. However, even if one supported development, which we do not, S.406 would not achieve its stated goal of environmentally protective development. This is because the bill for the most part fails to achieve minimal standards of environmental protection provided for in existing environmental statutes. Particularly egregious examples of this are discussed below.

A. REGULATORY STANDARDS IN S.406

1. The basic standard

The National Wildlife Refuge System Administration Act sets out a basic standard which requires that activities in a refuge be compatible with the purposes for which that refuge was established. The standard proposed in S.406, "avoid significant adverse effects," stands this idea on its head. Instead of putting wildlife values first, as required by current law, the new standard authorizes an undefined level of environmental impact in the Refuge, as long as such impact is not "significant."

In addition to authorizing environmental impacts beyond those allowed under current law, the vagueness of the standard is problematic. What are "significant" adverse effects? As it stands, the proposed standard is too vague, too laden with discretion, sets no firm requirements and represents an invitation to litigation.

2. "Best commercially available technology"

A second standard appears in §301, which requires the application of "best commercially available technology" for new oil and gas exploration, development and production operations.

Amendment No. 4 notes that nothing in the Act shall "be considered or construed as in any way limiting or affecting the

applicability of any other Federal or State law relating to the protection of the environment." We thus assume that the existing, much tighter technology standards in the Clean Water and Clean Air Acts would still apply to operations involving pollution discharges. However, other activities that can cause environmental damage such as construction and drilling would presumably be subject to the weaker "best commercially available technology" standard. For those activities subject to this latter standard, it will be argued that if a device or technology is out of stock, not immediately available, or too costly, it cannot be required.

Thus, instead of the type of technology-forcing standards in the Clean Water and Clean Air Acts, which are intended to propel environmental technologies forward, we have a standard that will discourage innovation and maintain the technological status quo. If the Arctic Refuge is indeed due a higher standard of care than most areas and we believe it is, "best commercially available technology" is not the way to achieve it.

B. THE BILL WEAKENS NATIONAL ENVIRONMENTAL POLICY ACT REQUIREMENTS.

Amendment No. 4 states that the LEIS accompanying the 1002 report satisfies the requirements of NEPA for purposes of developing leasing regulations.

As discussed above, the final LEIS was sharply criticized by EPA as being an inadequate basis for any Congressional action.[23] One of EPA's numerous criticisms focused on DOI's failure to include available knowledge about Prudhoe Bay development effects in the LEIS.

If the 1002 report is in fact adequate to satisfy NEPA requirements, there is no need for Congress to declare it adequate. If it is not adequate, proceeding with developing oil in a national wildlife refuge without a thorough and proper NEPA review is in our view inappropriate and irresponsible.

C. COMPLIANCE HISTORY EVALUATIONS ARE NOT REQUIRED.

Section 204 of the bill prohibits the Secretary from accepting a bid for a lease if the bidder is not meeting due diligence requirements on any other federal lease. Surely similarly strict language requiring a bidder to meet environmental requirements on other federal leases would be appropriate for oil and gas development in the nation's only arctic sanctuary for wildlife. The Surface Mining Control and Reclamation Act (SMCRA)[24] has this type of provision. SMCRA prohibits issuance of a mining permit to a company (or any subsidiaries thereof) that has an egregious history of violations of federal environmental statutes or if it

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has any outstanding violations of these statutes.[25] SMCRA governs activities on private lands; a national wildlife refuge should be subject to requirements at least as strict.

D. PROTECTIONS FOR SENSITIVE AREAS ARE INADEQUATE.

Section 302 declares the Sadlerochit Spring area a "Special Area" that is to be managed so as to protect and preserve the area's character and values. Section 302 goes on to authorize but not require the Secretary to exclude the Sadlerochit Special Area from leasing. In addition, while the bill authorizes the Secretary to designate other regions as "Special Areas," there are not requirements that he do so, nor are there any criteria or standards guiding the Secretary's decisions regarding site designation or subsequent exclusions from leasing under Sections 302 or 203. Finally, there are no provisions under which the Secretary can permanently protect sensitive areas.

E. THE BILL UNDULY LIMITS THE SECRETARY'S ABILITY TO PROTECT THE ENVIRONMENT.

A distinguishing characteristic of this bill is that it generally allows the Secretary broad discretion to facilitate oil and gas development, but very limited discretion to protect the environment. For example:

1) Section 201 not only authorizes but directs the Secretary to initiate a leasing program for the coastal plain, and §202(a) requires him to publish draft leasing regulations within nine months after enactment. Even if the Secretary wanted to revise the LEIS for purposes of developing leasing regulations, this time frame would prevent him from doing so.

2) Section 203(c) mandates a strict schedule for leasing and approval of exploration and development plans, regardless of NEPA compliance. In addition, the strict schedule of lease sales reduces the Secretary's ability to respond appropriately to unforseen events such as the discovery of major impacts on fish and wildlife.

3) Restricting the Secretary's ability to cancel a lease for environmental reasons to a situation where "the likelihood of a significant adverse effect will not disappear or the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable period of time" (§209(c)) means that leases could rarely if ever be cancelled for environmental reasons. This provision was modeled after a similar provision in Section 5(a)(2) of the Outer Continental Shelf Lands Act (OCSLA). To our knowledge no leases have ever been revoked under OCSLA for any reason, environmental or otherwise. In addition, §209 unreasonably restricts the Secretary's ability to cancel a

lease until the lease has been under suspension for five years.

F. THE RECLAMATION REQUIREMENTS ARE INADEQUATE.

The reclamation requirements in S.406 suffer from a variety of problems, including the following.

1) Given the tremendous cost of restoring sites on the North Slope (e.g., $2.6 million to remove facilities, revegetate land and monitor Chevron's exploratory well and reserve pit on KIC lands), the failure to impose a minimum reclamation bond is troubling.

2) The maximum performance bond required to cover major accidents (up to $1.5 million) is inadequate and does not address damage arising out of such things as air pollution. SMCRA sets no cap for private land. Why should less stringent bond requirements be imposed for a national wildlife refuge?

3) With respect to the duration of bonds, there are no specific standards that must be met before the Secretary returns the deposit. Furthermore, the fact that liability is terminated within 60 days after the Secretary determines bond conditions have been met means that if any future problems arise, the government may be stuck with the bill for clean up.

4) Perhaps in anticipation of this problem, Section 403 establishes a royalty-fed reclamation fund of up to $50,000,000. Based on a $2.6 million cost to remove facilities, revegetate land and monitor Chevron's KIC well, this fund would be large enough to restore only 16 exploratory well sites, and no production or support facilities, roads or pipelines, or hazardous or solid waste facilities. Moreover, while revenues in the fund can be used to compensate for damages caused by oil and gas exploration, full bond forfeiture by the responsible oil companies is not required before any payment is made. While the U.S. would have legal recourse to recover any funds expended, the bill does not require the U.S. to pursue such recourse.

5) Section 402 incorporates a standard that requires land to be reclaimed and restored to "a condition as closely approximating the original condition of such lands as is feasible using best commercially-available technology." Last year, U.S. Fish and Wildlife Service noted the following about currently available reclamation technology:

> [t]he effectiveness of mitigative measures in reducing the net loss of vegetative cover in the Arctic has been minimal.[26]

The Service further noted that:

> [a]lthough some effort has been made to reduce habitat loss..., rehabilitation efforts along the Pipeline System have resulted in little restoration of habitat values, and there has been virtually no concerted effort to restore such values in the oilfields.[27]

SMCRA has a much stricter standard for reclamation of private lands, requiring that reclaimed land support the uses which it was capable of supporting prior to mining, or higher or better uses. Important public lands in the Refuge would thus be subjected to much looser reclamation standards than are private lands under SMCRA. Similarly, lands in temperate zones that are more likely to recover on their own are subject to stricter standards under SMCRA than those proposed in S.406 for highly sensitive arctic areas.

6) Section 401 allows lessees to delegate or convey their responsibility and liability for reclamation, subject to the approval of the Secretary. We know of no other statute that allows parties to convey liability for environmental harm. Subcontracting for clean up and similar restoration is one thing; delegating liability is quite another. What is to prevent companies from conveying liability to an irresponsible operator?

G. MANY OF THE ENVIRONMENTAL STIPULATIONS LISTED IN AMENDMENT 5 ARE LARGELY MEANINGLESS FOR THE FOLLOWING REASONS.

1) The Secretary is not required to implement many of them. Many of the environmental stipulations listed in Amendment 5 and the 1002 Report have escape clauses that allow the Secretary the discretion to waive them.

2) Even if the stipulations were written into regulations, the fact that they are tied to the "avoid significant adverse effect" standard could make it very difficult to enforce them. For example, it would be extremely difficult if not impossible to demonstrate significant adverse effects through contamination of tundra wetlands with metals or other toxics until such effects occur. We simply do not know enough to be able to prove that widespread significant reductions will occur as a result of such pollution until they do occur. Even with respect to more obvious habitat-destruction impacts, it would be difficult to prove effects rising to the level of the standard until they are imminent or until they have already occurred.

3) A number of the stipulations in Amendment 5 are already authorized or required under existing law -- i.e., treatment and disposal of waste in compliance with applicable Federal and State law, oil spill contingency planning, etc.

I. MONITORING AND ENFORCEMENT

The minimum penalties provided in Section 214 are not as severe as those imposed in other statutes. For example, civil violations in S.406 carry a penalty of not more than $10,000 per violation. In contrast, the Clean Water Act imposes penalties of up to $50,000 per civil violation.

Section 214(g) provides for recovery of removal costs or damages arising out of oil, toxic or hazardous pollution. Unfortunately, this section is limited in terms of polluting factors that trigger liability. Many kinds of water pollution and most air pollution would likely not trigger clean-up liability, nor would any habitat damaging activities.

Finally, the Clean Water Act authorizes citizen suits to ensure that if state or federal agencies don't enforce the law, citizens can. There is no similar provision in S.406.

Thank you for the opportunity to testify.

FOOTNOTES

1. Comments critical of Interior's environmental analysis were submitted by the Government of Canada, the Northwest Territories, the Yukon Territory, the U.S. Environmental Protection Agency, the Congressional Research Service, the Marine Mammal Commission and others. Final 1002 Report, Vol. II.

2. See, e.g., EPA Detailed Comments on the Final Report to Congress/LEIS; CRS Comments on the final 1002 report.

3. EPA Detailed Comments at 1.

4. Id. at 2.

5. Id. at 3.

6. Walker, D.A., P.J. Webber, E.F. Binnian, K.R. Everett, N.D. Lederer, E.A. Nordstrand, M.D. Walker, 1987. "Cumulative Impacts of Oil Fields on Northern Alaskan Landscapes," Science, 6 November 1987, at 757.

7. The Department itself admits that the cumulative impact analysis in the 1002 report is inadequate:

> The discussion of this issue is brief, because the programmatic LEIS/report is intended to focus on the 1002 area and the specific natural resource questions raised by Congress. The issue of cumulative effects would be addressed in detail as part of the comprehensive environmental reviews that would be required if Congress authorizes the leasing of oil resources within the 1002 area.

Final 1002 Report/LEIS, at 200. Of course, it is difficult to understand how Congress can even decide whether to allow oil and gas leasing in the Refuge without an adequate cumulative impacts analysis. Moreover, Interior's predictions of future analysis ring hollow when the Final Report itself notes that the Report/LEIS may suffice for initial leasing (Final Report/LEIS, at 4).

8. EPA Detailed Comments at 3.

9. Id.

10. Letter to "All Interested Parties" from Alaska District Engineer Kakel dated December 27, 1988.

11. Assuming a generic chemical formula of CH_2 and 42 gallons/barrel. This simplified chemical formula represents the average of a wide variety of potential carbon/hydrogen ratios in crude oil.

12. U.S. Fish and Wildlife Service, December 1987 (released May 1988). Comparison of Actual and Predicted Impacts of TAPS and Prudhoe Bay Oilfields on the North Slope of Alaska.

13. Letter from Wilbur T. Gregory, Alaska District Engineer, to Robert McVey, National Marine Fisheries Service, dated May 5, 1988.

14. U.S.EPA, 1988. Causeways in the Alaskan Beaufort Sea, EPA, Region 10, October 1988.

15. Anchorage Daily News, February 18, 1989, at A-1.

16. Speer, L. and S. Libenson, 1988. Oil In the Arctic: The Environmental Record of Oil Development on Alaska's North Slope. Trustees for Alaska, National Wildlife Federation and Natural Resources Defense Council, January 1988.

17. America North, Inc., in prep. Oil and Gas Exploration, Development and Production in the Arctic National Wildlife Refuge. January 1989.

18. Woodward, D.F., E. Snyder-Conn, R.G. Reilly, and T.R. Garland, 1988. Drilling fluids on the arctic tundra of Alaska: assessing contamination of wetland habitat and the toxicity to aquatic invertebrates and fish. Archives of Environmental Contamination and Toxicology, 17, 683-697.

19. Letter from EPA Assistant Regional Administrator Al Ewing to Honorable Gerry Studds, dated July 5, 1988.

20. USFWS Hazard Notice: Polar Bear Killed by Improper Use, Storage or Disposal of Hazardous Materials. Dated September 27, 1988.

21. USEPA, July 6, 1988. Proposed Administrative Penalty Issues against ARCO Alaska, Inc., Kuparuk Seawater Treatment Plant, confirmed by phone, EPA Seattle, February 28, 1989.

22. Alaska Department of Environmental Conservation, North Slope District Office Printout of Compliance Actions/Enforcements, January 1, 1988 - October 25, 1988.

23. Letter dated June 1, 1987 from EPA Regional Administrator Robie Russell to Assistant Secretary William Horn at 2.

24. 30 U.S.C. §1201 et seq.

25. "The applicant shall file with his permit application a schedule listing any and all notices of violations of this chapter and any law, rule, or regulation of the United States, or of any department or agency in the United States pertaining to air or water environmental protection incurred by the applicant in connection with any surface coal mining operation during the 3 year period prior to the date of application....Where....any surface coal mining operation owned or controlled by the applicant is currently in violation of this chapter or such other laws referred to in this subsection, the permit shall not be issued until the applicant submits proof that such violation has been corrected or is in the process of being corrected....(emphasis added). 30 U.S.C. §1260(c).

26. USFWS, 1987, supra at 48.

27. Id. at 51.

The CHAIRMAN. Thank you very much, Ms. Speer.

Next we will hear from Margaret A. Moran, Special Assistant for ANWR to the Governor of Alaska.

Excuse me, Ms. Speer, before you leave, why do we not take about two or three minutes—not more—for questions for Ms. Speer, because we do not want to take the rest of them out of turn.

Ms. Speer, you referred to fisheries in the 1002 area, and I have been up there fishing. That is largely Arctic Charp?

Ms. SPEER. I believe the fisheries I was referring to was along the coast, not the rivers.

It is Arctic Cisco, I think. That is the concern, with respect to the causeways.

The CHAIRMAN. Are these commercial fisheries?

Ms. SPEER. I believe they are subsistence fisheries.

The CHAIRMAN. This is in the 1002 area?

Ms. SPEER. I am sorry.

What I was referring to was concerns that have been raised by the Corps and EPA about the impacts of these causeways on both commercial and subsistence fisheries within the Prudhoe Bay area, and not within the 1002 area.

The CHAIRMAN. Now, they did make a cut in the causeway there for the fish to go through.

Ms. SPEER. That is correct, but apparently that does not solve the problem.

The CHAIRMAN. Now, the effect on the fishery is on subsistence or sport fishery there—it is not on commercial fisheries, is that not correct?

Ms. SPEER. I believe—and I would have to go back and check—but I believe that the EPA report mentioned both commercial and subsistence fisheries, but I do not know the extent of commercial fisheries up there.

The CHAIRMAN. The Interior Committee report indicates there are less than 3,000 visits a year to the 1002 area, only some of whom are fishermen. Would you venture a guess as to how many people fish in the 1002 area?

Ms. SPEER. I do not know the answer to that question, but apparently there are subsistence fisheries up there, because EPA has expressed concern that they are being impacted.

The CHAIRMAN. We are dealing with very, very few people, though—two or three hundred? Not that that is not valuable, but I want to put it in context, compared, for example, to the fishery in the Gulf of Mexico.

I mean, it is not $1 billion a year commercial fishery?

Senator McClure?

Senator MCCLURE. Mr. Chairman, I am not aware of a commercial fishery in the area. I am aware of subsistence fishing as indeed the native populations depend upon all the resources for their subsistence—is that what you are referring to?

Ms. SPEER. Well, I could be wrong about this, but as I recall, the EPA raised concerns about both types of fisheries.

Again, I am not familiar with the extent of any commercial fisheries up there.

Senator MCCLURE. When you say that there would be unacceptable damage to the environment, that is against the backdrop of

maintaining a pristine environment unchanged by man, is that correct?

Ms. SPEER. That is correct, but the terms "unacceptable environmental damage" were actually the terms that were not used by us, but instead were used by the EPA and the Corps of Engineers when describing the impacts of the causeways.

Senator MCCLURE. Is that an objective standard or a subjective standard? What do you mean by "unacceptable"?

Ms. SPEER. Well, I presume that the Corps decided that the impacts to this fishery were very, very substantial, and were cause for very serious concern.

But we have a similar problem that was described by the Secretary in terms of the standard that is in this bill. It is very vague, and is not really defined in any clear sense. What does constitute a significant adverse effect? And that is cause for concern on our part, as well.

Senator MCCLURE. I think it is a cause of concern on everybody's part, because as I see it, it is a subjective standard, and depends upon the point of view of the person who is applying the standard—to some people, one thing is acceptable, to others, it is unacceptable.

And I do not know how we get around that, because I do not know how you would define it. I do not know how you can get a universally acceptable definition.

I suspect it would be worse than trying to negotiate the shape of the table at Panmunjon.

Ms. SPEER. Senator McClure, may I respond to one thing you said about the EPA report?

Senator MCCLURE. Certainly.

Ms. SPEER. The EPA report has videotapes and slides that accompany.

Senator MCCLURE. What EPA report are you talking about?

Ms. SPEER. I am sorry, the draft EPA report that was referred to in yesterday's article in the New York Times.

There are—apparently, it is my understanding—videotapes as well as slides. It is my understanding that we have slides, and the industry has the slides, so if you feel uncomfortable with including a draft report in the record, we could instead give you the slides, which could then be submitted in the record—because presumably the slides would not be altered, and they are slides of the specific chemical incidents.

Senator MCCLURE. When did you get the draft report?

Ms. SPEER. I reviewed the draft report late last week.

Senator MCCLURE. Late last week it was made available to you by somebody in EPA?

Ms. SPEER. It was made available to me late last week.

Senator MCCLURE. By somebody in EPA?

Ms. SPEER. I have pledged not to reveal the source.

Senator MCCLURE. Well, can you tell me whether it was somebody in the government or somebody outside of the government?

Ms. SPEER. Again, I feel—I am sorry. I take your request very seriously, and I do not mean to be obstructionist. But I would prefer not to reveal the source.

Senator MCCLURE. Have you visited Prudhoe Bay and done research there yourself?

Ms. SPEER. I visited Prudhoe Bay. I have not done research there myself.

Senator MCCLURE. So, the work you have done is based upon research that others have done?

Ms. SPEER. Yes, the compilation in my written testimony and my oral testimony is reflective of the expert agencies and not of NRDC.

Senator MCCLURE. Thank you very much, Mr. Chairman.

The CHAIRMAN. Thank you, Senator McClure

Senator Wirth?

Senator WIRTH. Thank you, Mr. Chairman.

Let me go back to the rationale for the speed with which we are doing this.

It is my understanding that all we want to do is to review, for new members of the committee, information that is already in the record, and that is what we have discussed a number of times.

Does the record, then, include the Fish and Wildlife Service study which talks about a variety of wildlife problems and a variety of wildlife impact problems? Is that all in the record now?

Ms. SPEER. I do not know the answer to that question.

Senator WIRTH. Do you know, Mr. Chairman, if all of that is in the record now?

The CHAIRMAN. We have the draft report as a part of our record, I think.

Senator WIRTH. Is the Corps of Engineers study in the record?

Ms. SPEER. I do not know, but I would be happy to supply it to the committee.

Senator WIRTH. Is that in the record, and, you know, these are very important statements, if in fact what we are concerned about is what the impacts are going to be.

It seems to me that we ought to have the opportunity, I would think, to talk to the Fish and Wildlife people. We did not have that before—and to talk to the Corps of Engineers people, and we have not had that before, to talk to the EPA people related to their October report, and we have not had that, to talk to the EPA people in the most recent alleged leak report, or the New York Times report, or your anonymous report, or the slide show, or whatever.

We ought, it seems to me, have an opportunity to talk to those individuals as well. It seems to me, as well, if we have problems, as has been stated, about the failure of State and Federal authorities, we ought to see if in fact there has been that kind of a regulatory failure.

I just think all of this information that is coming out, Mr. Chairman, really raises a question as to whether or not the committee does have information upon which to make a careful decision. We do not have any information about the administration position on national security so far. Presumably we will get that from Mr. Lujan.

We are not hearing from the Secretary of Energy on the administration's position on energy policy overall. We are not getting testimony related to the Fish and Wildlife Service's study, the Corps of Engineers study, the EPA studies——

The CHAIRMAN. Excuse me. We have had the Fish and Wildlife study since 1987, I think.

Senator WIRTH. Well, this was a May 1988 study.

Did you say this was a May, 1988 study?

Ms. SPEER. It was prepared and finalized in December of 1987, but it was not released to Mr. Miller's committee until May of 1988.

The CHAIRMAN. We have the draft. It is dated December, 1987. Here it is.

Senator WIRTH. Have we had testimony from the Fish and Wildlife Service about that—what the impacts are? I do not think that shows on the record, does it?

Ms. SPEER. I do not believe so—and the draft is dated 1987. But it was not released until May of 1988.

The CHAIRMAN. We have secret sources. [Laughter.]

Senator WIRTH. Do we have testimony from the Fish and Wildlife Service about those issues on the record, Mr. Chairman? I do not believe we have. I mean, all of this is to say—and I am perfectly happy for us to make a decision, if in fact, as has been stated, the committee has in front of it the available information.

I do not think we have had this kind of testimony. I do not think that we have heard from the Fish and Wildlife Service or the Corps of Engineers or EPA from two major studies that are important.

I do not think that we have heard from State regulatory authorities from all of the allocations being made about their bad management of the problem.

Let me ask you, if I might, another question.

The statement was made in the colloquy between, or the discussion between, the Secretary and Senator Rockefeller, that—by the Secretary that they could "stop any well that was causing a problem."

If there were problems in the Prudhoe Bay area, would those be from one single well, or from a variety of wells, or what would be the kind of problem that would have to be stopped?

Ms. SPEER. There are a large number of activities that are habitat impacting that could cause serious problems.

For example, waste disposal activities have created a lot of problems in terms of leaking pits and contamination of the tundra.

But I should note that in order for the Secretary to cancel a lease, he has to prove not only that there is a significant adverse effect, but also that the likelihood of that effect—he has to prove that that will not disappear within a reasonable period of time, or decrease to an acceptable extent.

And that standard is patterned on a similar standard in the Outer Continental Shelf Lands Act. To our knowledge, no leases have ever been cancelled under OCSLA for environmental or any other reasons.

So we would submit that by imposing that kind of standard, it would be extremely difficult for the Secretary.

Senator WIRTH. It is the kind of standard that sounds good if you say it fast enough, but if you look at the reality, it does not make a lot of sense—is that right?

Ms. SPEER. That is correct.

Senator WIRTH. Let me ask you about acceptable or unacceptable impact, the definition of that. We heard this morning from the Secretary that they believe that this drilling could occur in ANWR without an unacceptable impact.

Is there a definition from the administration about what is acceptable impact, or what is unacceptable impact?

Ms. SPEER. To my knowledge, there is no formal definition.

Senator WIRTH. How do we know that against which to base the decision, if in fact it is to be an acceptable impact, if there is no definition of what is acceptable or unacceptable?

Ms. SPEER. That is exactly it.

Senator WIRTH. Do you have any data on the record that says what an acceptable or unacceptable impact is to be? I do not.

Ms. SPEER. No.

Senator WIRTH. It just seems to me, Mr. Chairman—I understand what you are trying to do, and it seems to me that we, as a committee, have a responsibility to make sure that we have all of the information in front of us.

I think that just going through all of these specifics makes it very clear that we do not have all of the information in front of us.

I would think that the responsible thing for us to do is to make sure that all of this data is on the record, and that before we proceed, we know what it is that we are doing.

Thank you very much for being here.

The CHAIRMAN. If you have an extra copy of that EPA report, I hope you will send it to us. We will ask EPA for it as well.

Senator Murkowski?

Senator MURKOWSKI. Thank you, Mr. Chairman.

Senator MCCLURE. I think she was about to volunteer that she would submit the report.

Ms. SPEER. No, I was nodding, saying that is a good idea to ask EPA, and I also would recommend that perhaps the committee would be interested in seeing the videotapes, because those will not be changed.

They are videotapes of these incidents, as I understand it, and they may prove very edifying to the committee.

The CHAIRMAN. We will check on those.

Senator Murkowski?

Senator MURKOWSKI. Thank you, Mr. Chairman.

Ms. Speer, I would look forward to receiving this so-called report that evidently has come about through a little extra-curricular activity.

Ordinarily, I would expect the EPA to deliver the report and present it to the committee, but that is not the case.

I think, Mr. Chairman, it is appropriate to remind my colleague from Colorado that the issue of Alaska lands has been before this committee long before I came here. The Chairman and Senator McClure obviously have sat through many of these meetings, as has the senior Senator.

We have been addressing the issue of Alaska lands for over 15 years, and the issue of the 1002 area has been before this committee off and on, in one form or another, since 1980.

I would be happy to supply my colleague from Colorado the stack of numerous studies, so that he can sit down and review them. I

am sure that they would exceed his height. What we should be doing now is simply addressing the issue of making a decision. You are going to have to make a decision at some point, and you make those decisions from information. The information is on hand.

Obviously, there is reason to believe that we will have more information as we proceed but you cannot put aside the reality that a decision is going to have to be made.

Senator WIRTH. Would the Senator yield?

Senator MURKOWSKI. I am still continuing my questioning, and I will yield at the conclusion.

Ms. Speer, you indicated a number of animals that were on the decline. It seemed rather obvious that you omitted caribou. Was there a reason? In your litany on the number of animals that were on the decline, you just left out the predominant animal that is in the area, and the one that has caused the most concern.

Ms. SPEER. I was referring to the Fish and Wildlife Service report, and that report documented the declines in the populations I mentioned.

Senator MURKOWSKI. What does it say about caribou?

Ms. SPEER. I do not recall whether or not it deals with the porcupine caribou herd—I mean, with the central caribou herd.

Senator MURKOWSKI. I think you will find that particular report indicates there are about 4,200 caribou in the Central Arctic Herd at the time the pipeline was being built. Currently the herd is about 14,000 in number.

I think that is representative of the fact that if we try and keep a balance in this process, it is necessary to talk about the whole picture.

You state that combustion of 3.2 billion barrels of ANWR would produce 1.4 billion tons of carbon dioxide. Would that result occur regardless of where the oil came from?

Ms. SPEER. If in fact you do burn that oil.

But our testimony, add the testimony of Mr. Yeager, will go into alternative sources of energy that do not generate that kind of quantity of carbon dioxide that so threatens the global environment.

Senator MURKOWSKI. Finally, Mr. Chairman, with regard to the fishery up there—I have lived in Alaska all of my life, virtually, and to my knowledge, the only commercial activity associated with fishery on the North Slope involves one Bud Helmricks, who catches fish primarily for research groups that are doing studies.

And the additional fish that he catches are used for dog food, and sent down to Fairbanks. That is the extent of the commercial fisheries activity associated in the general area that we are talking about. That hardly represents a fair analysis of the significance on significant fisheries.

The North Slope Borough has indicated no decline in the fishery as a consequence of the construction of the causeways—do you agree with that?

Ms. SPEER. Well, I can tell you that I am reading here from EPA's—a quote from the EPA report. It says——

Senator MURKOWSKI. Is this the report, the draft of which has been leaked?

Ms. SPEER. No, this is the EPA report on the impacts of causeways, and they say, on water quality and habitat degradation "Place populations of anhydromous fish in the commercial and subsistence fisheries that rely upon them at substantial risk."

Senator MURKOWSKI. Well, I think is interesting to point out that the North Slope Borough disagrees with that, and they are the people who live there.

Senator MCCLURE. Would you yield on that question?

Senator MURKOWSKI. Yes.

Senator MCCLURE. Does that report predate the breaching of the causeways?

Ms. SPEER. No, this was a report issued in October of 1988, just five or six months ago.

Senator MCCLURE. I understand that, but was that the condition that existed before the breach?

Ms. SPEER. I do not know the answer to that question, but I can find out, and get back to you.

Senator MURKOWSKI. I think that my friend from Colorado wanted me to yield.

Senator WIRTH. No, thank you.

I was only making the point, the statement submitted earlier today, that all the information was in front of the committee—and it seems to me that it is very clearly documented that there are a variety of things that have not been made available, add presumably had there not been happy leaks, we would not have known anything about the most recent EPA report.

Senator MURKOWSKI. I would assure my colleague from Colorado, there always will be more information available on this subject.

The CHAIRMAN. Senator Conrad?

Senator CONRAD. I would, on my time, allow the witness to follow up. She had something she wanted to say.

Ms. SPEER. I just wanted to say, I think it was in a response to a question that you asked, but the Secretary indicated that NEPA would be complied with throughout the process.

In fact, this bill waives NEPA for the leasing regulation stage. It declares the existing LEIS as adequate, and given the tremendous questions that have been raised about the accuracy and the adequacy of that document by EPA, by CRS, by the government of Canada, by a host of very credible sources, we question the need to do that.

If this CRS is adequate for leasing regulations, then there is no need for this committee to declare it adequate. If it is not adequate, then we believe that proceeding with an international wildlife refuge without an adequate EIS is not environmentally protective, nor is it good public policy.

Senator CONRAD. Can you imagine the people outside the Beltway listening to this testimony, and all these acronyms, wondering what in God's name are we talking about up here?

Let me ask this—is it your position, and your organization's position, that under no circumstances should ANWR be developed?

Ms. SPEER. Yes. I say that in my written testimony. I should have said it initially. It is our position that this refuge should be wilderness. But even if you do not agree, we do not think that this decision should be made in the absence of complete, accurate and

objective information about the impacts that will occur in the refuge.

Senator CONRAD. Let me follow up on that.

Senator Murkowski has made the point--and I think it is probably accurate—that the information will never be complete. I mean, we do not deal in a world, unfortunately, where we ever have complete information.

I have yet to cast a vote in the Senate on which I felt I had all the information I would like to have. But let me pursue the basic notion—if in fact this is the last, best source of a major oil find in our country, and we are becoming increasingly dependent on foreign sources of crude, and if we were to experience, at some time in the future, an economic shock—by that I mean a deep recession, in which our budget deficits would skyrocket. Supposedly our trade deficit would become more severe—our status as the biggest debtor nation in the world becomes more serious, domestic interest rates increasing dramatically—under that set of circumstances, would you rethink the position that at no point should oil be pursued in this area?

Ms. SPEER. We would always consider what else was occurring at that time. But I think there are many, many things that the nation can do and should do to plan and prevent that very thing from happening.

And if Mr. Yeager in his testimony will outline a number of options that are available to us that can reduce our reliance on foreign oil, and get the nation off the track of being so dependent on those sources.

Senator CONRAD. I agree with that statement.

I think that without question, we need to do everything that we can to reduce dependence—conservation, alternative sources.

But I must say that as one member who has great respect for the environmental concerns, I also am very, very concerned about the economic position of our country, and I am very worried about what lies ahead.

We have heard testimony that it would take 10 years to bring this oilfield onstream. As one member, I look at what we are doing with the position of the United States in the world, and I am deeply concerned that we may face the set of theoretical situations that I described earlier, within that 10 year timeframe.

Does it ever strike you that if we were to prevent drilling or bringing an oilfield onstream 10 years from now, that 5 years from now, people might look back on us and say, "What a totally irresponsible thing to have done, given the overall context within which the Senate and the Congress were making those decisions?"

Ms. SPEER. I think, sir, that question is one we all ought to be asking ourselves, and I think the lack of a coherent national policy on strategy to wean ourselves of foreign imports is something that is a disgrace. And until we get that kind of national policy to provide ourselves with energy in the future, we will be always at risk for that situation.

I do believe firmly there are other alternatives. We do not have to go into the refuge right now and drill for that oil. There are many, many alternatives to that, and we need to do that in terms

of our economic position and the revenues that would be brought in from this in oil.

It seems to us that if we start selling off national treasures like the National Arctic Wildlife Refuge to service our national debt, how does that make us any different or any better than the Brazilians who we criticize so heavily for selling off their rain forest to solve their national debt problems. There are other ways of doing that, and we very strongly urge this administration and this Congress to impose and require the development of a renewable energy conservation strategy that can help serve the nation.

Senator CONRAD. One final question, if I might, Mr. Chairman. Is it your position, though, that if we were to have a national energy policy, which I absolutely agree with, we ought to have and we ought to do whatever we can to force the administration to provide leadership on that question. But, as I understand it, it is your position that as part of that overall policy, drilling in ANWR cannot be a component?

Ms. SPEER. We do not think it is needs to be a component.

Senator CONRAD. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Conrad.

Senator Burns.

Senator BURNS. Thank you very much. Did I hear you say you think it should be a part of our overall energy mix, is that correct?

Ms. SPEER. No, I said I do not think it needs to be.

Senator BURNS. Well, you have heard the questions around here, concerning ANWR, and we have all these reports flopping around here and nobody has them. I guess it would not make any difference. You would have to spend another two or three nights trying to catch up on what they say.

When you get down to the reports, it boils down to one man's opinion. It is kind of like the editor of the newspaper when he says, well, people think this. And I say no, people do not think it, the editor thinks that. You get down to a lot of subjective information.

The alternatives that we talk about in energy, solar, and geothermal, have all been discussed. If this country is driven by the private enterprise system, where are these? How come private enterprise is not picking up on these programs? Now we have environmental concerns about geothermal energy. In other words, just about the time we want to use them, somebody comes along and says well, do not change the pattern of everything under the ground. And so we have to leave that alone.

So, we have environmental questions there that come from organizations that you are representing. What is your answer as to why these alternative sources are not surfacing? If they can in compete with oil as an energy source where are they?

Ms. SPEER. Well, I think, first of all, that we are having—it is possible for the government to intervene in the market as it has done in the past to, for example, improve automobile fuel economy standards. That merely by improving automobile fuel economy standards to about 40 miles per gallon fleet average for cars and 30 miles per gallon fleet average for trucks would save five times the amount of oil that the department thinks lies within the Arctic National Wildlife Refuge. That can be achieved by the year 2008.

If it is achieved by the year 2008, then we can save that amount of oil. And we think that those kinds of strategies are worth pursuing.

Senator BURNS. Would you agree that if you had a completely government-controlled source of energy, and if we cut it off and allowed another alternative source to come forward, do you think we would get into a situation similar to a controlled economy like the U.S.S.R. They cannot even feed their own people because they just cannot grow enough food? I mean, are we headed that way?

Ms. SPEER. I certainly hope not, and that is certainly not what we would recommend.

Senator BURNS. Would you say that would be a danger?

Ms. SPEER. I would not because the federal government has in the past imposed fuel economy standards, and we have yet to turn into a Communist country.

Senator BURNS. I do not have any other questions.

This is a remote area of the earth and even though the environment is very important, it impacts very few people and the energy it contains is very important to the state of Alaska and very important to the security of this country. I want to know, when we get hungry, and when we get cold, do we start worrying about places like ANWR?

I congratulate the Chairman and the ranking member for this bill, and I think we are out in front of it, and we want to stay out in front of it. If alternatives surface in the meantime. Maybe there will never be any need to drill, but we have to know if it is there, and I think this is very important from this nation's standpoint.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Senator Burns.

Senator Rockefeller.

Senator ROCKEFELLER. A brief question, Mr. Chairman—also of the Chairman. Will the EPA report be available to members of this committee either late this afternoon or tomorrow?

The CHAIRMAN. As soon as we get it, we will have it in the files here, and it will be available. And if they will give us the slide show, we will also make that available.

Ms. SPEER. Excuse me, we have copies of the slides, and we would be happy to do a presentation for the committee or for the staff if that is what you want.

Senator ROCKEFELLER. One question. Does the Natural Resources Defense Council or did they support the methanol bill from natural gas from coal which passed last year? That is in the alternative fuels category.

Ms. SPEER. I am sorry, I can find out that question. I do not know the answer to it.

Senator ROCKEFELLER. Would it be possible that my office know this afternoon?

Ms. SPEER. Absolutely.

Senator ROCKEFELLER. Thank you very much. Thank you, Mr. Chairman.

Senator MURKOWSKI. Mr. Chairman.

The CHAIRMAN. Senator Murkowski.

Senator MURKOWSKI. It would seem to me, Mr. Chairman, that this report that we have heard so much about really should come from EPA or an appropriate representative of EPA.

The CHAIRMAN. We will ask EPA for it.

Senator MURKOWSKI. We need to find out whether it is a formal report or just a leaked draft, and while I appreciate the concerns expressed here, I guess the question that I always have, Mr. Chairman, is how much is enough. You know, 19 million acres is an area equal to the size of South Carolina. It is a pretty good chunk of real estate. We need to balance how much is enough.

We have got 56 million acres of wilderness in our state. We have 62 percent of the 90 million acres of the national wilderness system in our state, 45 percent of ANWR is wilderness, eight million acres.

The CHAIRMAN. Well, I tell you what we have got——

Senator MURKOWSKI. How much is enough? How much wilderness is reasonable in Alaska?

The CHAIRMAN. Let us not—the witness is supposed to leave at twelve, and it is past that.

Ms. Speer, thank you very much.

Senator WIRTH. Mr. Chairman, if I might ask, we are asking the EPA for this report.

The CHAIRMAN. Yes.

Senator WIRTH. Can we ask the Corps of Engineers for theirs as well? Do we have that?

The CHAIRMAN. If you would like the Corps of Engineers, we will ask them, too.

Anybody who has anyone who wants to be asked, tell Tom Williamson. He is our chief asker.

Our next witness will be Margaret A. Moran, Special Assistant for ANWR to the Governor of Alaska.

STATEMENT OF MARGARET A. MORAN, SPECIAL ASSISTANT FOR ANWR TO THE GOVERNOR, STATE OF ALASKA

Ms. MORAN. Thank you, Mr. Chairman.

Members of the committee, my name is Margaret A. Moran. I am the Special Assistant for the Arctic National Wildlife Refuge to Governor Steve Cowper of Alaska. I want to thank you for the opportunity to present the reviews of the state on the federal management of the coastal plain or the Arctic National Wildlife Refuge.

The State of Alaska strongly supports federal legislation to open the coastal plain of ANWR to oil and gas exploration and development consistent with appropriate environmental stipulations.

Mr. Chairman, I have a written statement with a number of attachments, and with your permission, I will submit that for the record.

The CHAIRMAN. Yes, all written statements will be put in.

Ms. MORAN. Mr. Chairman, during the last session of Congress both here and in the Senate and in the House, Governor Cowper and members of his resource agency staffs and his staff have testified extensively on a number of topics that have arisen surrounding the opening issue. We believe that these topics have now been

covered exhaustively by Congress and that Congress should now move forward with opening legislation.

Mr. Chairman, I would like to touch on three points today. First, the hydrocarbon potential of the area; secondly, the importance of a joint federal/state monitoring and surveillance agreement; and finally, on the disposition of revenues from that area.

Last summer we produced six billion barrels of Prudhoe Bay oil. That means that more than one half the total proven ten billion barrels of recoverable reserves have now been produced, and that the largest field that North America has begun its inevitable production decline with North Slope production currently accounting for 25 percent of our domestic production, the reality is that at Prudhoe Bay, production declines, that oil must be replaced by more domestic production or by imports.

In 1973 when the Arab oil embargo caused such severe economic dislocation in this country, the U.S. was only 35 percent dependent on foreign oil. Today, the U.S. is approximately 43 percent dependent on such oil. By the early 1990s imported oil will account for over 50 percent of domestic demand. The inevitable Prudhoe Bay decline, the rising level of imports, and the 10 to 15 year leadtime that is necessary for oil development in the Arctic leads the State of Alaska to inescapable conclusion that we must begin now if we are to explore, develop and produce ANWR oil, assuming oil is found by the turn of the century.

Some concern has been expressed that we need a national energy policy before ANWR is opened for development. The national energy policy is important to this country but certainly we must realize that whatever our national energy policy is, oil will be a component.

The crucial issue is where that oil will come from because ANWR is the most prospective unexplored petroleum province left in North America. This area must be factored into our national energy policy, no matter how that policy may evolve.

In a similar vein I have heard the argument that ANWR should not be developed because the best we can expect is a 6-month supply of oil. The analogy, of course, is inappropriate and it completely disregards the reality of how oil is produced.

Prudhoe Bay best illustrates the problem with this type of argument. That field, too, could—the total production capability of that field, too, could be expressed in either days or months. But doing so masks the fact that since 1977 Prudhoe Bay has produced one and one half million barrels of oil a day for this nation and in combination with the Kuparuk and Endicott fields produces 25 percent of our domestic production. This type of production combined with the federal and state revenues generated the jobs created and the diminution of imports provides a better illustration of what we can expect should ANWR be opened.

I have also heard some say that while oil prices are low and oil is abundant, we should drain America last. This, of course, assumes that future stable supply of foreign oil. It also disregards the time frame for Arctic development and the role imported oil plays in our rising trade deficit. Both national security and economic efficiencies argue strongly for expeditious confirmation of ANWR's potential.

Moving to the issue of joint federal/state monitoring, one of the most important lessons that we have learned from the history of petroleum development at Prudhoe Bay and elsewhere on the North Slope is that environmental results are a function of the effort put into planning design operation and oversight of the environmental protection measures.

There has been oil and gas exploration and development on the Arctic slope now for over 20 years. During this period our technology and our operating practices as well as our federal and state regulatory requirements have evolved considerably. This experience sheds light on what works in the area and where we need improvement.

An essential approach—an essential element of any approach to mitigating impacts on fish and wildlife as well as protecting the area's environmental quality is cooperation between the federal and state governments and industry. The most effective means of ensuring coordination while recognizing the authorities of the respective state and federal agencies is to establish formally an interagency process to oversee and participate in project planning, design, review, permit actions, monitoring and enforcement.

Similar joint state/federal teams have been used successfully in large-scale developments in Alaska in the past, and I would state—I would cite the Trans-Alaska Pipeline System construction and also the preconstruction phase of the Alaska natural gas transportation system.

We believe that effective environmental protection can be accomplished only with adequate staffing and funding. The state believes that it is essential that a funding mechanism be placed in this bill that provides for both state and federal regulatory agencies that will be involved in ANWR oversight.

And finally, Mr. Chairman, related to the issue of development is the matter of revenue disposition under the Alaska Statehood Act and the Mineral Leasing Act of 1920, the State of Alaska receives 90 percent of the governmental share of bonuses, rentals and royalties derived from oil and gas leasing around wildlife refuges. We oppose any change to this revenue sharing formula for many reasons. Because of the shortage of time I will not go into those reasons. They are outlined in my statement, and I am not sure that they will have any effect. [Laughter.]

Senator MURKOWSKI. Do not give up. I have not. [Laughter.]

Ms. MORAN. But, Mr. Chairman, the Governor has stated and Senator Murkowski stated earlier that the state does realize that 50 percent of something is better than 90 percent of nothing.

Your provision in your bill cutting our revenue sharing causes us great discomfort, but another provision in your bill causes even greater discomfort, and that is the provision that provides that following enactment of ANWR legislation reducing the state's royalty share that if Alaska chooses to challenge this reduction in court and wins, then the entire leasing scheme fails.

We think that a blackmail cause of this type is offensive and does not represent good public policy. The practical effect of this provision is for Congress to give one state, Alaska, a veto power over whether ANWR will be opened and whether it will be an element of this nation's energy policy.

Certainly the nation should not be penalize if one state decides to go to court to test a claim arising under its statehood act.

Further, the provision violates the basic concept of fairness by penalizing Alaska for asserting its rights under its statehood act.

Mr. Chairman, to conclude, the coastal plain does have a tremendous potential to contribute to this nation's economic strength and energy security. We believe that if we work together, that legislation can be passed that will open the area to exploration, development and production, and at the same time protect the environmental resources of the area.

We look forward to working with you and your staffs as you consider this important issue.

[The prepared statement and attachments submitted by Ms. Moran follow:]

Testimony of Margaret A. Moran
Before the
Senate Committee on Energy and Natural Resources
March 6, 1989

Mr. Chairman and members of the Committee:

My name is Margaret A. Moran. I am the special assistant for the Arctic National Wildlife Refuge (ANWR) to Governor Steve Cowper of Alaska. I want to thank you for the opportunity to present the views of the State of Alaska on federal management of the coastal plain of the Arctic National Wildlife Refuge.

The State of Alaska strongly supports federal legislation to open the coastal plain of ANWR to oil and gas exploration and development, consistent with appropriate environmental stipulations. During its deliberations, Congress should focus on the central issue of whether to provide access to this area's petroleum potential and its attendant benefits to the national economy and national security. The State of Alaska, by virtue of its more than 20 years of managing oil and gas development in the Arctic, is well-placed to assist you in accomplishing your task.

Last summer, we produced the six billionth barrel of Prudhoe Bay oil. This means that more than one-half the total proven 10 billion barrels of recoverable oil have been produced, and that the largest field in North America begun its inevitable production decline. With North Slope production currently accounting for 25 percent of all U.S. oil production, the reality is that as Prudhoe Bay production declines, that oil must be replaced by more domestic production or by imports. All North Slope oil is used for domestic consumption.

U.S. oil production has dropped to its lowest level in 25 years, while domestic consumption of petroleum products is at a peak for the 1980's and is increasing at about 2 percent a year. This drop in domestic production and the rise in consumption have increased demand for imported petroleum.

In 1973, when the Arab oil embargo caused such severe economic dislocation, the U.S. was only 35 percent dependent on imported oil. Today, the U.S. is approximately 43 percent dependent on such oil. By the early 1990's, imported oil will account for over 50 percent of domestic demand.

The inevitable Prudhoe Bay decline, the rising level of imports, and the 10-15 year lead time that is necessary for oil development in the Arctic, leads the State of Alaska to

the inescapable conclusion that we must begin now, if we are to explore, develop, and produce ANWR oil (assuming oil is found) by the turn of the century.

Some concern has been expressed that we need a national energy policy before ANWR is opened for development. A national energy policy is important to this country, but certainly we must realize that whatever our national energy policy is, oil will be a component. The crucial issue is where that oil will come from. Because ANWR is the most promising unexplored petroleum province in North America, this area must be factored into our national energy policy, no matter how that policy may evolve.

In a similar vein, I have heard the argument that ANWR should not be developed because the best we can expect to recover is a 6 month supply of oil. The analogy of course is inappropriate. It completely disregards the reality of how oil is produced.

Prudhoe Bay best illustrates the problem with this type of argument. The total production capability of this field could also be expressed in terms of days or months. Doing so masks the fact that since 1977 Prudhoe Bay has produced 1.5 million barrels a day for this nation, and that in combination with the nearby Kuparuk and Endicott fields it currently accounts for 25 percent of our domestic production. This type of production, combined with the federal and state revenues generated, the jobs created, and the diminution of imports, provides a better illustration of what we can expect should ANWR be opened.

I have also heard some say that while oil prices are low and oil is abundant, we should "drain America last." This, of course, assumes a future stable supply of foreign oil. It also disregards the time frame for Arctic development and the role imported oil plays in our rising trade deficit. Oil imports are responsible for 25 percent of the trade deficit.

BACKGROUND

By way of background, ANWR is located in the northeastern corner of Alaska, and comprises 19 million acres. The only area that would be open to oil and gas activity is the 1.5 million-acre coastal plain, or 8 percent of ANWR. However, according to the Interior Department's 1002 report, only 12,000 acres (less than 20 square miles) are likely to be affected by development.

Although there has been much debate about designating ANWR lands as wilderness, it should be noted that 42 percent of ANWR (8 million acres) is already established as wilderness. Included in this category are 450,000 acres of the coastal

plain and 30 miles of coastline. The 450,000-acre coastal plain wilderness adjoins Canada's 3 million-acre Yukon National Park.

HYDROCARBON POTENTIAL

The coastal plain of ANWR is the most prospective unexplored petroleum province left in North America. It has been clearly demonstrated by federal, state and independent investigators that the coastal plain (or 1002) area could yield Prudhoe Bay-size quantities of petroleum. As you know, the Prudhoe Bay field on Alaska's North Slope is the largest oil field in North America, with original reserves of nearly 10 billion barrels of recoverable oil.

All of the key geologic elements necessary for major hydrocabron accumulation exist beneath the 1002 area. Oil seeps, oil-stained reservoir rocks and excellent quality petroleum source rocks are present. Large subsurface structures and traps have been mapped from seismic data. The federal 1002 report documents 26 of these large, prospective structures beneath the surface of the coastal plain. In addition, the 1002 area lies between the huge discoveries at the Prudhoe and Kuparuk oil fields to the west, and the Canadian Mackenzie Delta field to the east.

How much oil ANWR holds is not known and, in fact, cannot be known until exploratory drilling is undertaken to confirm or refute our expectations. It is estimated, however, that if oil is found beneath the coastal plain, there is a five percent probability of finding between 26.5 and 29.4 billion barrels of oil. This compares favorably with the 23.5 billion barrels initially in-place at Prudhoe Bay.

Exploring for oil and gas in frontier areas such as the coastal plain of ANWR is an economically risky enterprise. The Interior Department estimates there is a 19 percent chance of finding oil on the coastal plain. History shows that unexplored areas produce oil discoveries only 5 percent of the time. Thus, a 19 percent chance of finding oil, almost four times more than usual, presents an excellent opportunity. Geologists agree that ANWR represents one of this nation's last opportunity to find a giant oil field of the magnitude of Prudhoe Bay. For perspective, it is noteworthy that prior to drilling, some industry officials estimated that there was only a 2 percent probability that the Prudhoe area contained as much as 2 billion barrels of oil. (Attachment 1)

FISH AND WILDLIFE

The existence of valuable fish and wildlife resources in ANWR has been recognized for many years. Athapaskan Indian, Inupiat, and Inuvialuit Eskimo cultures have depended on

many of these resources for generations. With proper mitigating measures, development can occur with minimal impacts on fish and wildlife. For example, by allowing only necessary developments in zones along major rivers and along the coast, the impacts on fish, musk, oxen, polar bears, waterfowl, and shorebirds can be minimized.

In contrast, some areas, such as spring-fed fish over-wintering areas, are so sensitive to development that most activities--especially water withdrawal-- should not be allowed.

The Porcupine Caribou Herd is one of four herds found on Alaska's North Slope and the second largest in North America. Wildlife biologists have concluded that a 242,000 acre area is especially important for reproduction of the Porcupine Herd. The State is confident that if this area receives special attention and if appropriate stipulations are in place for the remainder of the coastal plain, then oil and gas exploration and development can proceed in ANWR while adequately protecting the Porcupine Caribou Herd.

In addition to our statutory authority over resident fish and wildlife in ANWR, we stand ready to use our considerable experience with oil development elsewhere to assist federal agencies with minimizing impacts on fish and wildlife populations and habitats in ANWR. (Attachment 2)

WASTE MANAGEMENT

One of the most important lessons to be learned from the history of petroleum development at Prudhoe and elsewhere on the North Slope is that environmental results are a function of the effort put into planning, design, operation, and oversight of environmental protection measures.

The Alaska Department of Environmental Conservation (ADEC) is the State regulatory agency with primary responsibility for environmental protection. ADEC has programs governing air quality, water pollution control, solid waste management, hazardous waste management, and oil spill prevention and response. The agency writes permits specifying emission levels and disposal methods, monitors activities under permits, reviews plans, conducts inspections, provides technical assistance, and takes enforcement actions when needed. ADEC has considerable experience with the effects of oil and gas activities and is in a good position assuming adequate funding to develop effective environmental protection measures for new areas like the Arctic National Wildlife Refuge (ANWR).

There has been oil and gas exploration and development on the Arctic Slope for over twenty years. During this period, technology and operating practices, as well as federal and

state regulatory requirements, have evolved considerably. This experience sheds light on what works in the arctic environment and where improvement is needed.

The State believes that, with proper management and oversight, exploration and development can be conducted while protecting the special values of ANWR. This will require continuing the improvements in waste management practices that have occurred during the history of petroleum development in the Arctic. Congress will set the level of performance for ANWR. A good foundation already exists for developing effective environmental protection measures that deliver the performance envisioned by Governor Cowper.

Meeting this challenge will require careful use of lease stipulations and permit conditions that build upon what we have learned from other North Slope developments. In addition, field monitoring and, if necessary, enforcement are essential. Finally, a cooperative effort by all State and federal agencies will contribute toward meeting this challenge.

Attached to my testimony is a summary of waste stream management and other environmental protection issues relevant to development in ANWR. (Attachment 3)

JOINT FEDERAL/STATE MONITORING

An essential element of any approach to mitigating impacts on fish and wildlife, as well as protecting the area's environmental quality, is cooperation between the federal and state governments and the industry. To this end, we believe that Congress should establish a joint state/federal interdisciplinary team to oversee and participate in project planning, project design review, permit actions, field monitoring and compliance. Similar joint state/federal teams have been used successfully in Alaska for large scale development projects such as the Trans-Alaska oil pipeline system and the preconstruction phase of the Alaska Natural Gas Transportation System. Attached is suggested amendment language. (Attachment 4)

REVENUE DISPOSITION

Related to the issue of development is the matter of revenue disposition. Under the Alaska Statehood Act and the Mineral Leasing Act of 1920, the State receives 90 percent of the governmental share of bonuses, rentals, and royalties derived from oil and gas leasing within wildlife refuges. We oppose any changes to this revenue sharing formula for several reasons.

First, Congress applied the Mineral Leasing Act to Alaska in Section 28(b) of the Alaska Statehood Act, and considered

this to be a major provision of that Act. Because provisions of a Statehood Act are agreed to and binding upon both the United States and the affected state, Congress cannot act independently to change those conditions.

Second, modification of the funding formula would discriminate against the State of Alaska. Other western states also receive the equivalent of 90 percent of revenues from minerals leasing which occurs on public lands. These states receive 50 percent directly; another 40 percent is invested in the Reclamation Fund, which finances reclamation projects within western states, excluding Alaska.

Third, changing the revenue sharing formula for Alaska would set a precedent for altering other revenue sharing arrangements which benefit a number of states. These programs reflect a philosophy of land management which the Congress has consistently applied since the turn of the century.

Finally, a reduction in the State's share would come at a particularly difficult time in Alaska's history. With the marked reduction in the world price of oil upon which Alaska is so dependent, our people are experiencing depressed economic conditions including high unemployment, mortgage foreclosures, and cutbacks in state services. In these circumstances, to reduce possible revenues from development of ANWR would represent an especially hard blow.

In addition to a proposed reduction, a further restriction on Alaska's claim to its royalties has been proposed. The provision provides that following enactment of ANWR legislation reducing Alaska's royalty share, if Alaska chooses to challenge the reduction in court and wins, the entire ANWR leasing scheme would fall.

A "blackmail" clause of this type is offensive and does not represent good public policy. The practical effect of this provision is for Congress to give one state, Alaska, a veto over whether ANWR will be open and whether ANWR will be an element of this nation's energy policy. Certainly, the nation should not be penalized if one state goes to court to test a claim arising under its statehood act. Further, the provision violates the basic concept of fairness by penalizing Alaska for asserting its rights under its statehood act. (Attachment 5)

LAND EXCHANGES

Another area of concern is the so-called ANWR land exchanges. Former Interior Secretary Donald Hodel proposed to trade approximately 166,000 acres in ANWR to six Native Corporations and their oil industry partners in exchange for

891,000 acres of surface estate in other refuges in Alaska with an estimated value of $538.7 million.

There are compelling national reasons why these trades should not proceed. In September, 1988, the Government Accounting Office (GAO) released its report on the proposed exchanges. The GAO recommended that the Secretary of the Interior discontinue consideration of the proposed land exchanges. The GAO further suggested that if the Secretary of the Interior decided to proceed with the proposed exchanges and presented them to Congress for approval, the Congress should disapprove them. The GAO cited the following concerns with the proposed exchanges: 76 percent of the land selected would provide limited wildlife and habitat protection, undervaluation of ANWR oil and gas interests, overvaluation of the surface estate of the private lands proposed for exchange, failure to retain a royalty provision for the benefit of the government, and lack of any competitive bidding process for the oil and gas tracts. (Attachment 6)

CONCLUSION

To assist you in your deliberations, I am submitting for the record testimony by a number of State officials which explores the above topics at greater length.

To conclude, the coastal plain has the tremendous potential to contribute to this nation's economic strength and energy security. If we work together, legislation can be passed that will open the area to exploration, development, and production. At the same time, we can provide the environmental measures necessary to protect and preserve the natural resources in the area. The State of Alaska strongly supports the opening of the coastal plain to oil and gas development. We look forward to working with you and your staffs as you consider this important issue.

Attachment 1

TESTIMONY OF JAMES E. EASON

BEFORE THE HOUSE SUBCOMMITTEE ON WATER AND POWER RESOURCES

JUNE 23, 1987

Mr. Chairman and members of the Subcommittee, my name is James E. Eason. I am a petroleum geologist with thirteen years of experience in Alaska, and I am the Director of the Alaska Division of Oil and Gas. The Division of Oil and Gas is that agency within the Alaska Department of Natural Resources which is responsible for the competitive leasing of the state's oil and gas lands, the administration of those leases and the collection of the state's share of revenues from the leasing of its lands, and from the leasing of federal lands within Alaska and adjacent to certain of the state's offshore submerged lands.

Before turning to a discussion of the history of the development of Alaska's oil and gas resources, and describing current production within the state, I would like to stress two very important points. First, I believe oil and gas leasing and development in Alaska is extremely important to both the state and the nation, and second, I am convinced that the coastal plain (or 1002 area) of the Arctic National Wildlife Refuge (ANWR) is the most prospective unexplored petroleum province remaining in North America.

As a result of the field work and geophysical surveys conducted over the past twenty years, it has been clearly demonstrated by federal, state and independent investigators that the 1002 area could yield Prudhoe Bay-size quantities of petroleum. To put this conclusion in proper perspective, the Prudhoe Bay field on Alaska's North Slope, is the largest oil field in North America, with original reserves of nearly 10 billion barrels of recoverable oil. Production from the Prudhoe Bay field and the adjacent Kuparuk River field currently accounts for over 20% of the total daily domestic crude production.

Situated on trend between the prolific North Slope oil fields to the west and the petroleum-rich Canadian Mackenzie Delta province to the east, the 1002 area has all of the key geologic elements requisite for major hydrocarbon accumulations. Based on field observations of oil seeps and oil-stained reservoir rocks at surface outcrops, it is evident that oil has been generated by source rocks in the area. Hopefully, most of that oil has migrated into and been trapped within reservoir rocks in the very large structures which lie beneath the surface. The quality of source and reservoir rocks found in ANWR represent the best of both Prudhoe Bay and Mackenzie Delta. In addition, based upon

the limited geophysical data collected to date, twenty-six large prospective traps have been identified beneath the surface of the 1002 area. It is estimated that if oil is contained within these structures beneath the 1002 area, there is a five percent probability of there being between 26.5 and 29.4 billion barrels of oil in-place. This volume compares favorably with the 23.5 billion barrels of oil initially in-place at Prudhoe Bay. For additional perspective, it is interesting to note that prior to drilling, some industry officials estimated that there was only a two percent probability that the Prudhoe Bay area contained as much as two billion barrels of oil.

Exploring for oil and gas in frontier areas such as the coastal plain of ANWR is an extremely risky enterprise. The worldwide success ratio for exploratory wells in frontier areas is about one success in twenty, or 5%. In ANWR, the odds are estimated to be much better. The federal government estimates there is a twenty percent chance that economically recoverable oil is present in the 1002 area. This is an exceptionally high number for such a small area.

In our opinion, exploration to confirm ANWR's petroleum potential is clearly in the interest of the state and the nation. We in Alaska have just recently witnessed the production of the five billionth barrel of oil from Prudhoe Bay. This means that one-half of the total proven 10 billion barrels of recoverable oil have been transported through the Trans-Alaska Pipeline System (TAPS) in just ten short years. It also means that the largest field in North America, which currently contributes a major share of this country's daily production, will begin a precipitous and irreversible production decline in the near future (mid 1988).

Presently, North Slope crude flows through TAPS at a rate of about 685 million barrels per year. By the year 2000, even projecting the contributions of other known North Slope fields expected to come on line, annual production from Alaska will fall to approximately 386 million barrels per year. This volume represents only about 55% of the pipeline's capacity.

If the coastal plain of ANWR is opened to exploration and if petroleum is discovered in significant quantities, production from this region could help to offset the expected decline in

North Slope production. Most experts believe that by the year 2000 domestic oil production will be substantially less than the current 8.3 million barrels per day--it likely will be between 4.5 million and 6.4 million barrels per day. ANWR could contribute at least 700,000 barrels per day to the year 2000 totals, and 1.5 million barrels per day for the following ten years before its production decline begins. This increased production would be at the expense of imported oil, thereby contributing positively to our nation's balance of payments and its energy security.

It is clear to the state of Alaska that the high prospectivity of the coastal plain of ANWR, and its potential to supplement the projected domestic production decline, thereby reducing our oil imports, justifies an early and thorough assessment of the area by exploratory drilling. I believe a review of the history of oil and gas exploration and development in Alaska will underscore the importance and wisdom of proceeding with an orderly exploration program now rather than later.

Opening the 1002 area for drilling would be adding a crucial --and perhaps final--chapter to Alaska's long history of involvement in petroleum exploration and development. This involvement began around the turn of the century when early explorers and whaling crews reported occurrences of natural petroleum seeps along coastal regions of the state. Those discoveries were the harbingers of the exploration successes of the 1960's and 1970's which were to confirm the presence of massive oil and gas reserves along the North Slope of Alaska. It was the perseverance of the early explorationists--often in the face of staggering failures, which led to the discoveries of Prudhoe Bay and Kuparuk River, respectively North America's first and second largest producing oil fields.

The sheer magnitude of those North Slope discoveries tends to overshadow many important successes--and failures--elsewhere in Alaska during the intervening years. I believe it is important to review some of these other oil and gas milestones, because I think they will underscore the importance of exploring and confirming ANWR's potential without delay.

The state's earliest commercial petroleum development was of a much more modest scale than most North Slope development, and was located hundreds of miles south of Prudhoe Bay near the village of Yakutat along the Gulf of Alaska. Here, in 1902 the Katalla Oil Field was discovered. Before Katalla was abandoned in 1933 due to a fire at the production facilities, this field produced 154,000 barrels of oil. In thirty-one years Katalla produced less oil than is currently transported through TAPS every two hours!

The next major milestone in oil and gas development within Alaska came with the 1957 discovery of oil at the Swanson River Field by Richfield Oil Corporation and its partners. That onshore discovery on the Kenai Peninsula adjacent to Cook Inlet led quickly to the leasing, exploration and development of numerous onshore and offshore tracts within the Cook Inlet Basin. Since that first discovery at Swanson River, a total of 21 oil and gas fields have been discovered in Alaska's Cook Inlet.

Although the State of Alaska's competitive lease sales in the Cook Inlet Basin continue to draw moderate attention, most knowledgeable explorationists believe that Cook Inlet development has seen its zenith. Cumulative production from the area through 1986 was 1.073 billion barrels of oil and 4.9 trillion cubic feet of natural gas. The average annual decline in oil production is approximately 15 percent, and current total Cook Inlet production is about 46,000 barrels per day. Again for perspective, the combined daily oil production from all Cook Inlet fields amounts to slightly more than the volume moved through TAPS every thirty minutes.

Industry interest and the mapping of numerous extremely large subsurface structures in the Gulf of Alaska led the U.S. Department of the Interior, in 1976, to conduct its first competitive oil and gas lease sale in Alaskan waters, OCS Sale 39. Because of prior production onshore in the nearby Katalla area, the Gulf of Alaska then was considered to be highly prospective. Three federal OCS lease sales in the Gulf of Alaska generated total bonus bids of $670 million dollars for leases located there. However, exploration of those leases resulted in a succession of 12 very expensive dry holes.

The failure of the Gulf of Alaska to meet everyone's expectations serves to emphasize that, even in Alaska, and even next door to confirmed production, there is no certainty of success when it comes to oil and gas exploration. As a matter of fact, this unfortunate pattern--the subsequent condemnation of otherwise extremely prospective federal OCS acreage adjacent to previous discoveries--has since been repeated all too often in Alaska.

Like the Gulf of Alaska, the early successes in the Cook Inlet Basin did not assure similar successes on adjacent federal OCS tracts. In 1977 the first of three federal OCS sales in the Lower Cook Inlet was held. These sales netted the federal government $403 million in bonus bids, but resulted again in 12 dry holes. In fact, results were so discouraging that the final Lower Cook Inlet OCS sale, which was held in 1982, received no bids.

I would like to focus now, for a few minutes, on the history of exploration on Alaska's North Slope. In 1919, a geologist with the U.S. Geological Survey, Ernest de K. Leffingwell, traversed

the area on foot and with dog teams, recording the first formal descriptions of North Slope geology and documenting the locations of several oil seeps. After Leffingwell, other expeditions led by geologists of the U.S.G.S. followed. These survey teams mapped and documented the surface exposures of many potential petroleum deposits in Northern Alaska.

Based in large measure upon the results of these early surveys, in 1923, the Naval Petroleum Reserve No. 4 (now National Petroleum Reserve-Alaska) was established. The first exploration phase of NPR-4 ended in 1953; in the intervening years between 1923 and 1953 the United States Navy had drilled 37 test wells and found three oil accumulations and six gas accumulations within the Reserve. Only two of these discoveries were considered sizeable, namely Umiat, with 30 to 100 million barrels of oil and Gubik, with 370 to 900 billion cubic feet of gas. Gas from another of the discoveries, the small South Barrow gas field, is being produced today for local consumption at Barrow. The Navy's 30-year exploration effort in NPRA cost the federal government between $50 and $60 million.

In 1960, the Arctic National Wildlife Range (ANWR) was established. The closure of this area, extending eastward from the Canning River to the Canadian border, combined with prohibitions against competitive leasing in NPRA to the west, effectively confined industry exploration efforts to the area between the Colville and Canning Rivers. In 1964, the State of Alaska selected about 80 townships in this corridor between NPRA and ANWR, and in December of that year, the state held its first competitive North Slope lease sale, and exploration of the resulting leases began shortly thereafter.

Following a succession of seven dry holes in the arctic foothills to the south, exploration shifted northward to the central coastal plain. In 1965, the first dry holes in the area immediately surrounding the Prudhoe Bay structure were drilled. In January, 1967, in what was essentially a last ditch effort, a rig was moved to the Prudhoe Bay State No. 1 location. Twelve months later, in January, 1968 the discovery of the Prudhoe Bay oil field was announced.

Thirty-three exploratory wells were drilled the following year, and in September, the state held its 23rd Competitive Lease Sale which consisted of acreage near and adjacent to the Prudhoe Bay discoveries. That sale attracted over $900 million in bonus bids. This was the last lease sale on the North Slope until the Joint Federal-State sale in December, 1979. After the discovery of the Prudhoe Bay field and before the 1979 joint sale, over 100 exploratory wells were drilled on the North Slope, with 19 of those wells discovering oil or gas.

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In 1974, exploration began again in NPRA, this time under the direction of the U.S. Geological Survey. Between 1974 and 1981 twenty-seven exploratory wells were drilled within NPRA at a cost to the federal government just over a half billion dollars. After the federal exploration program ended, Congress authorized competitive leasing in NPRA, and three sales were held. The first two of these sales received minimal interest, and the third received no bids. Only one additional exploratory well has been drilled on the leases acquired in those sales, and it was another dry hole.

Including the 1979 Joint Sale, three federal lease sales have been held in the Beaufort Sea. These three sales produced total winning bonus bids of $3.4 billion. Eighteen exploratory wells have been drilled offshore in the OCS area extending eastward from NPRA to ANWR. The results have included five announced discoveries near the Prudhoe Bay field, one each near Seal and Sandpiper Islands, two near Tern Island and one near Duck Island (Endicott). Also, a very recent discovery by Unocal at its Hammerhead #1 well is located about 10 miles offshore of Flaxman Island.

Since 1979, the state has conducted ten competitive lease sales, offering over 3.7 million acres of onshore North Slope and submerged Beaufort Sea acreage. Total bonuses received for these leases were more than $700 million. To date, these leases have produced only two discoveries, one oil discovery at Colville Delta by Texaco and its partners, and another by Shell Oil, et al at Seal Island. The Seal Island discovery straddles both state and federal acreage. These are the only successes on state acreage since 1979 contrasted to a long list of exploratory failures drilled to test the area.

Although new discoveries have been scarce, the post-Prudhoe Bay exploration activity has resulted in better delineation of several significant hydrocarbon deposits, both onshore and in the Beaufort Sea. These include the discoveries at Point Thomson, Kuparuk River, Milne Point, Gwydyr Bay, Endicott, Mikkelsen, Seal Island, Sandpiper Island, West Sak, Colville Delta, Tern Island, Lisburne and other areas.

The Kuparuk River reservoir was discovered in 1969, and production commenced from the Kuparuk River Unit in 1981. It is estimated that this reservoir west of Prudhoe Bay contains 1.5 billion barrels of recoverable oil. Production from the reservoir has been much better than expected, and is currently at 290,000 barrels per day.

ARCO Alaska has applied for approval of a pilot enhanced recovery project (Miscible Gas Injection) in an effort to boost ultimate recovery from the reservoir. A major waterflood program is already underway.

Although the Lisburne Oil Pool was discovered just days after the Prudhoe Bay Sadlerochit Oil Pool, production did not commence from this deeper reservoir until December, 1986. It is estimated that the Lisburne reservoir contains 3 billion barrels of oil in-place, with about 400 million barrels being recoverable. Production is currently about 40,000 barrels per day, and is expected to peak at about 100,000 barrels per day. Ultimate recovery from the reservoir will increase if a pilot waterflood project now underway proves to be successful, and if permits for an offshore drill site are ultimately approved. The Kuparuk River and Lisburne fields no doubt benefited from the infrastructure already in place at Prudhoe Bay.

The nearby Milne Point field, with estimated reserves of about 60 million barrels of recoverable oil, was brought on line in 1985 only by virtue of its close proximity to the infrastructure that resulted from the Prudhoe Bay-Kuparuk River development. Milne Point was subsequently shut-in January, 1987 due to the low price of oil.

The Endicott accumulation, discovered in 1978 and operated by Standard Alaska Production (BP), is located approximately 30 miles east of Prudhoe Bay. It has estimated recoverable reserves of about 375 million barrels. Production from Endicott is expected to commence in late 1987 or early 1988, and peak at approximately 100,000 barrels per day in 1989, marking the first ever commercial production from offshore acreage in the Beaufort Sea. The production rate can probably be maintained for about five years, at which time a 15% per year production decline will begin. Endicott is located two miles offshore in eight to ten feet of water, and is connected to land by a gravel causeway. In relative terms, Endicott is the most costly North Slope field to be developed to date.

The Point Thomson field, which lies east of Endicott and just west across the Canning River from ANWR, was discovered in 1977 by Exxon and its partners. Point Thomson is estimated to contain about 350 million barrels of recoverable condensate (light gravity crude) and 5 trillion cubic feet of gas. Development of this field is problematical under the current economic conditions and in light of the 60 mile distance from the Trans-Alaska Pipeline and other production infrastructure. If discoveries are made to the east of Point Thomson in ANWR or on nearby state or federal offshore acreage, the outlook for early development of this field would improve substantially.

In 1983, Shell Oil drilled a successful exploratory well at Tern Island, about 20 miles east of Prudhoe Bay field. A third well in this area has just been completed, but estimated recoverable reserves have not yet been published.

The Seal Island discovery, which lies offshore from the Prudhoe Bay Field, was made in 1984 by Shell, Amerada Hess and partners. It is located about eight miles offshore in 40 feet of water, approximately 20 miles from Pump Station 1. Reserves at Seal Island are estimated to be similar to those in Endicott, somewhere in the 300 million barrel range. The reservoir appears to straddle the state/federal Beaufort Sea boundary. The distance from shore and water depth will make this a very expensive prospect to develop. Higher oil prices and the expectation of continued higher prices will be required to initiate development and production from this discovery.

In 1986 Shell, Amoco and partners announced another discovery offshore northwest of Prudhoe Bay field at Sandpiper Island. Sandpiper is about eleven miles northwest of the Seal Island discovery. Estimated recoverable reserves have not, as yet, been published for Sandpiper. It is likely, however, that the development of Sandpiper will be linked to that of the adjacent Seal Island discovery.

Included within the boundaries of the Kuparuk River oil field is a very large oil accumulation known as the West Sak reservoir. The West Sak is estimated to contain at least 20 billion barrels of oil in place. Those massive reserves lie literally right in the center of the second largest producing oil field in North America. Unfortunately, the oil within the West Sak reservoir is only 3000 feet to 4000 feet below the surface, and only 1000 feet to 2000 feet below the bottom of the overlying permafrost layer. Consequently the oil is cool (70 to 90 degrees Fahrenheit), and it has a low gravity of 10 degrees to 20 degrees API. The combination of these factors precludes the heavy oil from flowing into the wellbores very rapidly.

Compared to a good Prudhoe Bay well which produces over 5000 barrels per day, an excellent West Sak well might produce only 500 barrels per day. The shallow reservoir depth also means that there is very little gas dissolved in the heavy oil, and therefore, minimal pressure to drive the oil into the wellbores. The shallow depth adds another negative factor, in that fewer wells can be drilled directionally (due to steep drilling angles) from each individual drilling pad. These factors will add considerable development expense to the West Sak project.

Poor oil quality, low flow rates and added development expense have all combined to keep the West Sak from being developed at today's oil prices, even though it lies within the boundaries of the Kuparuk River field and is only twenty miles or so from Pump Station 1 of TAPS. Even though the volume of oil in place is staggering by any standards, the West Sak awaits higher oil prices and additional technological advances to make its development possible.

Oil prices in the mid $20 per barrel range would go a long way toward making the West Sak commercial. However, even if and when the West Sak does come on line, the total daily field rate will be relatively insignificant in comparison with current rates from Prudhoe Bay and Kuparuk River because of the low individual well rates. If the West Sak development does not piggy back onto the existing Kuparuk development, it may never come on line.

Having described the chronology and briefly highlighted some of Alaska's most promising discoveries, as well as its exploration failures, I would like to summarize what I believe these data are telling us regarding Alaska's and the Nation's future production capabilities. The state's only commercial production to date, with the exception of the minor production from the Katalla field, has come from either the Cook Inlet or the North Slope. The Cook Inlet production is now in a state of decline, and the basin itself is in a mature or advanced state of exploration--large additions to the known reserves are unlikely.

The current production from Prudhoe Bay field far surpasses the combined production from all other North Slope and Cook Inlet fields. The new North Slope discoveries announced over the last few years, although encouraging, will have little effect in delaying the precipitous Prudhoe production decline that will begin in the near future. As I have previously mentioned, by the year 2000, we project total Alaska production to be only 386 million barrels of oil per year.

The stark reality is that the list of past exploration failures in Alaska on both federal and state lands has grown quite long since the monumental discovery at Prudhoe Bay. The list of failures includes the Gulf of Alaska, Lower Cook Inlet, several interior basins, the Alaska Peninsula, NPRA, and large portions of the western and central North Slope, both onshore and offshore. In the past two years, there has been a succession of dry holes drilled in the once promising OCS frontier basins offshore of western Alaska, including the St. George, Navarin, and Norton Basins.

Since the discovery of oil in Cook Inlet in 1957, 65 exploratory wells have been drilled on federal OCS leases while several hundred more have been drilled on state leases in Alaska. These wells were drilled at a substantial cost to the oil and gas industry. While the total costs are not readily determinable, the leases alone cost over $7.5 billion, and in the vast majority of cases, wells drilled to test these leases were disappointing. Because of the disappointing results elsewhere in Alaska, exploration now has shifted to the eastern North Slope and Beaufort Sea. But, historically, even in these prime prospecting areas, failures far surpass successes. Perhaps one of the most famous examples is the much-touted Mukluk prospect in the

Beaufort Sea west of Prudhoe Bay. Leases overlying that prospect drew about $1.4 billion in competitive industry bids in 1982, and the first well there cost an additional $150 million to drill. As we all know now, Mukluk turned out to be another major disappointment.

These failures serve to emphasize two very important points. First, we cannot simply assume that ANWR holds oil and gas reserves which can be banked for future development. Our pre-drilling estimates of resources there may in fact be seriously in error, as they were at NPRA and Mukluk. Both national security and economic efficiency argue strongly for expeditious confirmation of ANWR's potential. Secondly, there are no areas left in this country with the potential, such as ANWR, to substantially and positively affect our nation's overall balance of trade and national security.

The discoveries at Seal Island in the Beaufort Sea and the huge West Sak heavy oil deposits west of Prudhoe Bay may help to supplement future North Slope production volumes, but only if oil prices climb and stabilize above $20 per barrel (in 1987 dollars). Unfortunately, however, unless a new multi-billion barrel discovery is made on the North Slope, annual throughput in TAPS will decline significantly beyond 1995 regardless of what the oil price may be at that time.

There are obviously many direct benefits that would follow if ANWR is opened to exploration and if oil is found in commercial quantities and developed. However, I would like to direct your attention to some of the secondary, indirect benefits that I believe would follow as a result of construction of an oil pipeline from ANWR discoveries westward to TAPS Pump Station #1. First, total projected TAPS throughput would increase significantly, and tariffs for all oil transported through TAPS would decrease, resulting in a net higher wellhead value for the oil. This means that existing fields like Prudhoe Bay and Kuparuk River could produce longer, and discoveries such as West Sak and Seal Island may become economic to develop.

Secondly, exploration for new fields would increase since expected revenues from any new discoveries would be higher if pipeline tariffs are lower. Onshore state, federal and native lands, and offshore state and federal tracts would benefit from the increased pace of exploration. Future discoveries in the deeper waters of the Beaufort Sea, where development will be extremely expensive, will have a greater likelihood of being explored, developed and produced.

In addition, existing discoveries located between Pump Station #1 and ANWR would be developed sooner since a major part of the required infrastructure, that is the pipeline, would be in place. For example, Point Thomson field, which is immediately adjacent

to ANWR and contains about 350 million barrels of recoverable oil, could probably support development with some incremental help from ANWR discoveries. The catalytic effect of new discoveries in ANWR on extending the field life of producing North Slope fields and in encouraging new exploration and development elsewhere along the Arctic coast of Alaska cannot be overemphasized. There truly is no better place and no better time to explore for the oil reserves that will be critical to this country's energy future.

Mr. Chairman and members of the Subcommittee, this concludes my written testimony. I greatly appreciate the opportunity to provide this subcommittee some information on oil and gas production in Alaska and the history of that development. I also appreciate the opportunity you have provided me to explain why I believe it is crucial that the coastal plain of ANWR be opened for competitive leasing without delay. I will be happy to answer any questions you may have.

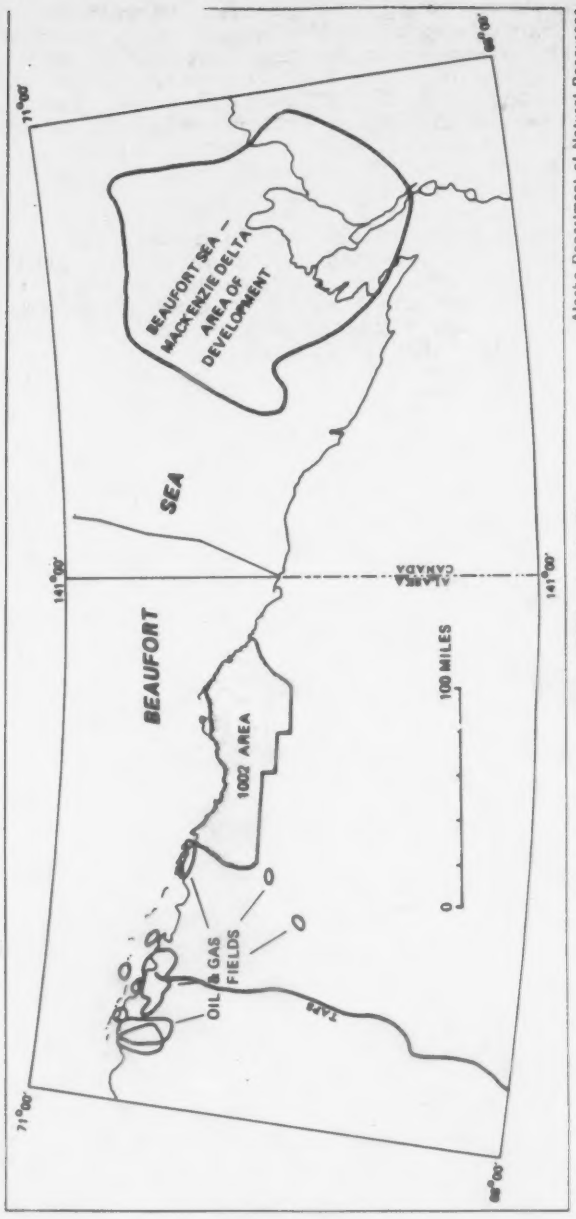

Figure 1. 1002 Area Location Map.

Alaska Department of Natural Resources
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ANWR COASTAL PLAIN: HIGH HYDROCARBON POTENTIAL

1. ANWR coastal plain situated on trend between North Slope oil fields to the west, and the Canadian Mackenzie Delta province to the east.

2. All key geologic elements requisite for major hydrocarbon accumulations are present:
   - excellent source and reservoir rocks expected; represent the best of Prudhoe Bay and Canada.
   - producing formations at Prudhoe and adjacent areas found within ANWR.
   - documented oil-stained sandstones and oil seeps.
   - 26 large structural traps (prospects) mapped from seismic data.

3. Expensive well drilled on largest prospect (Jago River #1, KIC); results are confidential.

4. 5% probability of finding between 26.5 and 29.4 BBO in-place.

5. 20% probability of finding economically recoverable oil:
   - exceptionally high for such a small area
   - minimum economic field size in ANWR = 440 million barrels
   - worldwide success ratio in frontier areas is 5%

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Figure 2. ANWR Hydrocarbon Potential Summary.

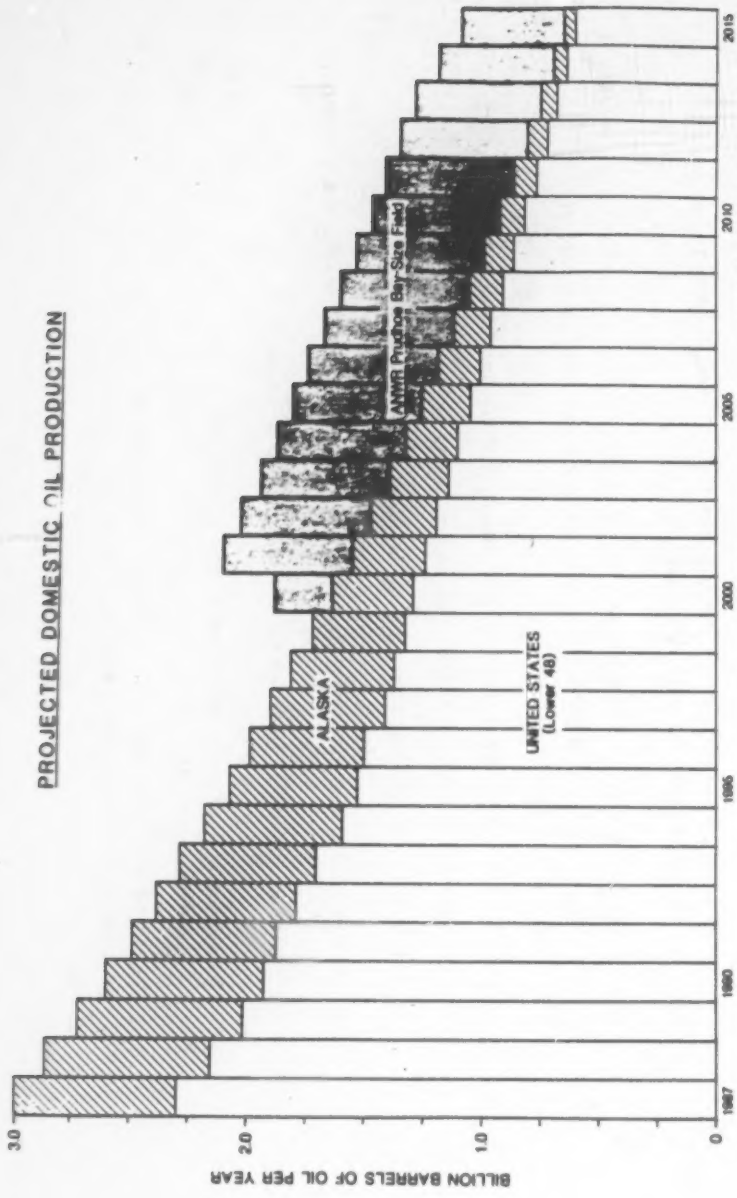

Figure 3. Projected Domestic Oil Production.

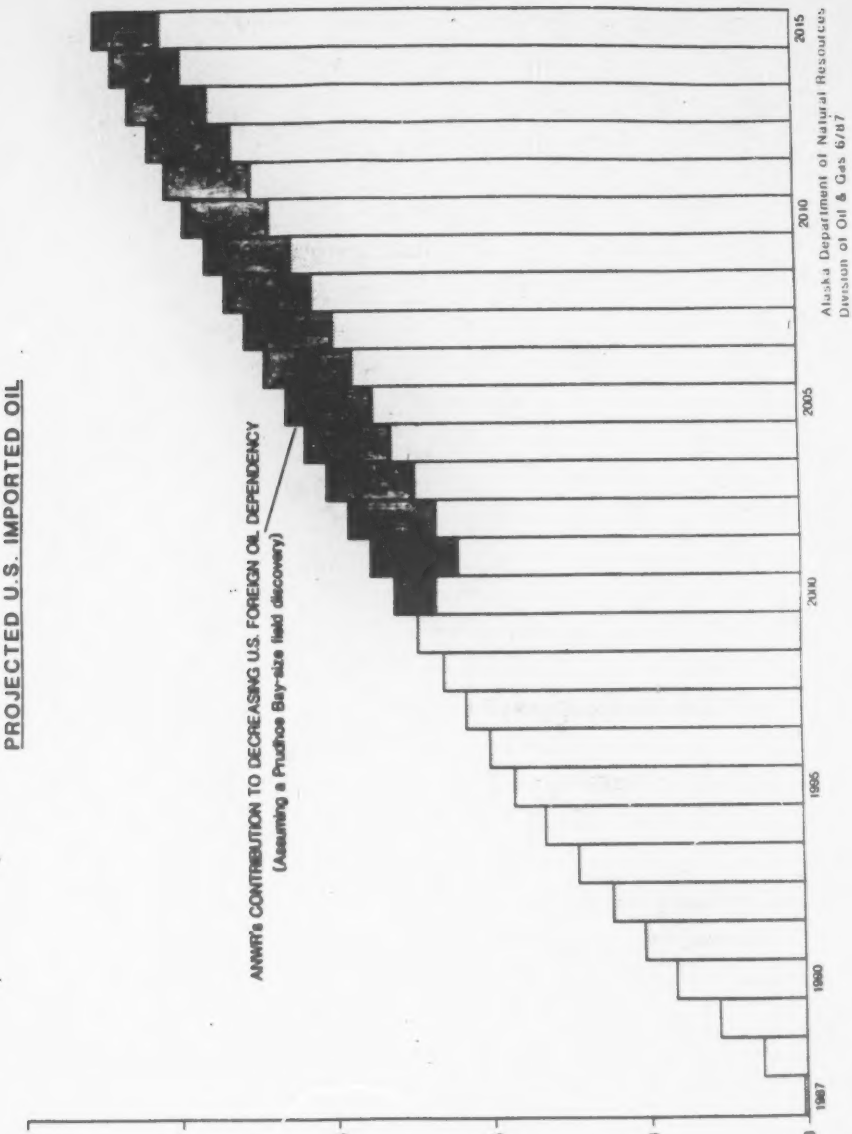

Figure 4. Projected U.S. Imported Oil.

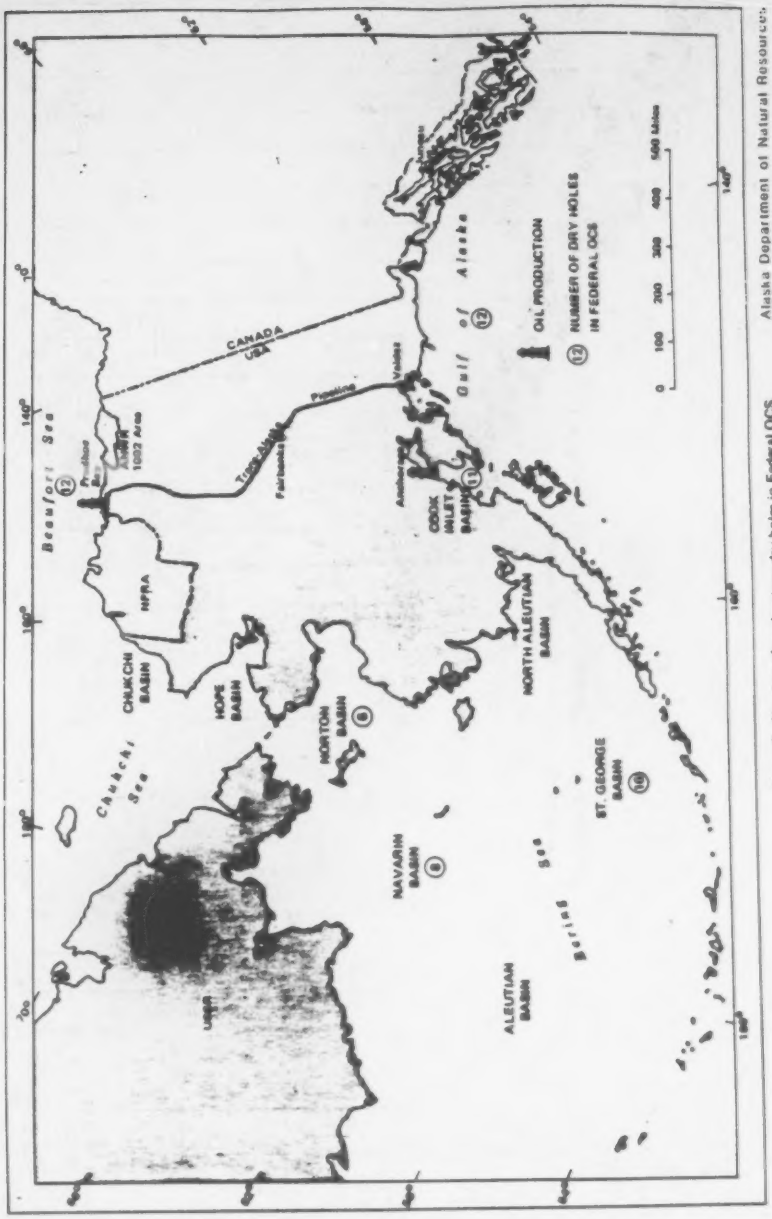

Figure 6. Number of exploratory dry holes in Federal OCS.

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Cook Inlet/Gulf of Alaska Oil and Gas Fields

As of January 1, 1987

Field Name	Discovery Date	Company	Estimated Original Recoverable Reserves	Production Start-up Date	Cumulative Production	Remaining Reserves
Swanson River	7/57	Richfield Oil Corp.	250 BCF 217 MMBO	7/60	Gas reinjected 205 MMBO	250 BCF 12 MMBO
N. Cook Inlet	8/62	Pan American Petro.	1584 BCF	2/69	777 BCF	817 BCF
Granite Point	6/63	Mobil Oil	105 BCF 126 MMBO	2/67	90 BCF 104 MMBO	15 BCF 22 MMBO
Trading Bay	6/65	Union Oil	63+ BCF 90 MMBO	1/67	62 BCF 88 MMBO	++ 2MMBO
McArthur River	10/65	Union Oil	965 BCF 574 MMBO	9/67	315 BCF 523 MMBO	650 BCF 51 MMBO
Middle Ground Shoal	6/62	Pan American Petro.	86 BCF 162 MMBO	12/68	78 BCF 150 MMBO	8 BCF 12 MMBO
Beluga River	12/62	Standard Oil of Cal.	1003 BCF	1/67	229 BCF	774 BCF
Cannery Loop	6/79	Union Oil	300 BCF	(11/87)	0	300 BCF
Falls Creek	8/61	Standard Oil of Cal.				
Nicolai Creek	5/68	Texaco				
North Fork	12/65	Standard Oil of Cal.	54 BCF	Shut-in	0	54 BCF
West Foreland	3/62	Pan American Petro.				
West Fork	9/60	Halbouty Alaska				
Sterling	8/61	Union Oil	25.1 BCF	1/68 Shut-in	2.1 BCF	23 BCF
Birch Hill	2/67	Standard Oil of Cal.	11 BCF	Shut-in	0	11 BCF
Beaver Creek	6/66	Marathon Oil	241.5 BCF 4 MMBO	10/82	47.5 BCF .3 MMBO	194 BCF 1 MMBO
Iron River	10/66	Standard Oil of Cal.		Shut-in	0	
Lewis River	9/75	Cook Service		9/84		
Moquawkie	11/65	Socony Mobil Oil	504 BCF	Shut-in	4 BCF	500 BCF
Pretty Creek	2/79	Halbouty Alaska		12/86		
Stump Lake	5/78	Chevron USA		Shut-in	0	
Kenai	10/59	Union Oil	2498 BCF	6/61	1740 BCF	758 BCF
Totals			7606.6+ BCF 1173 MMBO		†3345.6 BCF 1073 MMBO	4361 BCF 100 MMBO
		Gulf of Alaska				
Kodiak	1962	Alaska Development Co.	?	1972 Shut-in 1933	194,000 BO	?

*BCF - Billion Cubic Feet of Gas
MMBO - Million Barrels of Oil

++ Included in McArthur River Remaining Reserves
† Does not include reinjected gas

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Figure 6. Cook Inlet/Gulf of Alaska Oil and Gas Fields.

North Slope Oil and Gas Fields

As of January 1, 1987

Field Name	Discovery Date	Company	Estimated Original Recoverable Reserves	Production Start-up Date	Cumulative Production	Remaining Reserves
Prudhoe Bay	12/67	Richfield Oil Corp.	28,500 BCF 9590 MMBO	10/69 (Tests) 7/77(Pipeline)	6423 BCF ** 4918 MMBO	25,816 BCF 4672 MMBO
Kuparuk River	4/69	Richfield Oil Corp.	640 BCF 1600 MMBO	12/81	345 BCF ** 292 MMBO	566 BCF 1308 MMBO
Prudhoe Bay (Lisburne Pool)	12/67	Richfield Oil Corp.	≈ 635 BCF 400 MMBO	11/83 (Tests) 3/85	11.4 BCF ** 5.3 MMBO	624 BCF 395 MMBO
Milne Point	10/69	Socal	? ≈ 60 MMBO	5/85-1/87 Shut-in	1.9 BCF 5.4 MMBO	? 55 MMBO
Endicott	3/78	Sohio	731 BCF 375 MMBO	(Late 87-Early 88)	0	731 BCF 375 MMBO
S. Barrow	4/49	U.S. Navy	25.2 BCF	8/49	17.2 BCF	8 BCF
E. Barrow	5/74	U.S. Navy	12.4 BCF	12/83	3.4 BCF	9 BCF
Totals			35,543.6 BCF 12,375 MMBO		6801.9 BCF ** 5220.7 MMBO	32,754 BCF 7155 MMBO

* BCF - Billion Cubic Feet of Gas
MMBO - Million Barrels of Oil

** Portions of Gas Reinjected

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Figure 7. North Slope Oil and Gas Fields.

Undeveloped North Slope Oil and Gas Discoveries

As of June 16, 1987

Name	Discovery Date	Company	Estimated Recoverable Reserves
Umiat	12/46	U.S. Navy	50 MMBO
Gubik	8/51	U.S. Navy	600 BCF
E. Umiat	3/63	McCulloch Oil	?
West Sak	4/69	Richfield Oil Corp.	?
Kavik	11/69	Richfield Oil Corp.	?
Kemik	6/72	Forest Oil	?
Flaxman Island	9/75	Exxon USA	?
Pt. Thomson	10/77	Exxon USA	5000 BCF 350 MMBO
Mikkelson	1978	ARCO Alaska	?
Gwydyr Bay	1981	Conoco	<50 MMBO
Tern Island	5/83	Shell Oil	?
Seal Island	1/84	Shell Oil	300 MMBO
Colville Delta	1985	Texaco USA	?
Hammerhead	2/86	Unocal	?
Sandpiper Island	1986	Shell Oil	?

*BCF - Billion Cubic Feet of Gas
MMBO - Million Barrels of Oil

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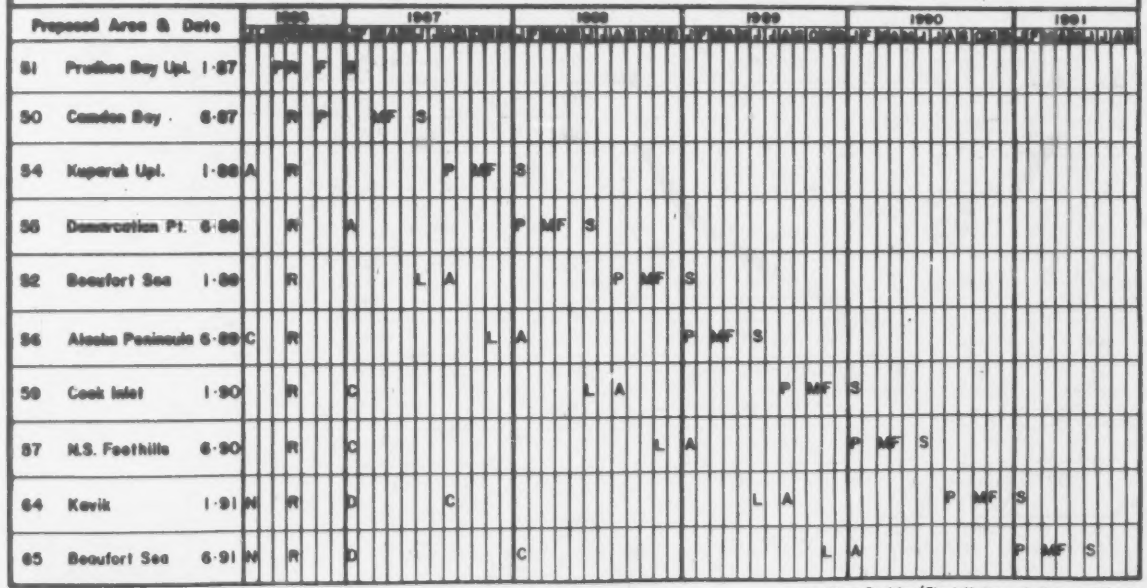
Figure 8. Undeveloped North Slope Oil and Gas Discoveries.

FIVE-YEAR OIL & GAS LEASING PROGRAM

ALASKA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL & GAS



N = Call for Nominations
R = Request for Comments on Proposed New Sales & 5- Year Schedule Revisions
D = Proposed Sale Area Included in 5-Yr Leasing Document
C = Call for Public Comments

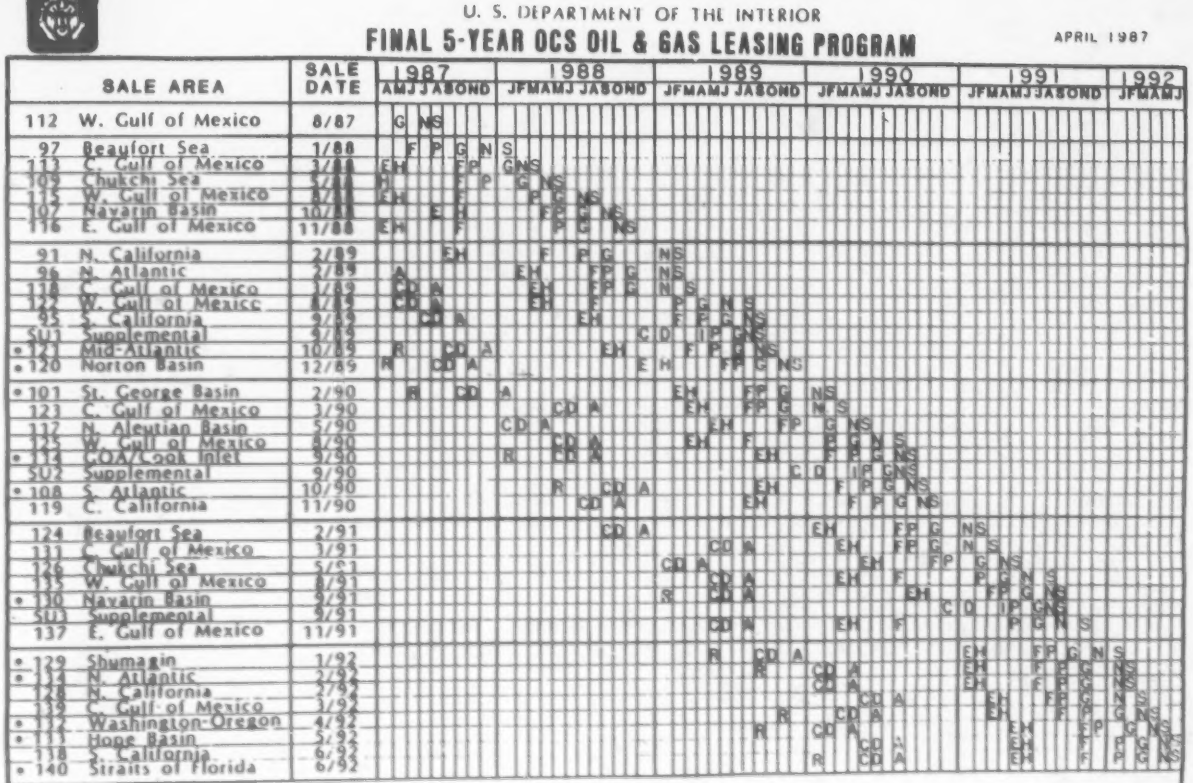
L = Preliminary Land Status Check
A = Agency & Public Comments Requested for Socioeconomic/Environmental Analysis
P = Preliminary Analysis/Preliminary Notice (AS 38.05.945(a)(3))

F = Final Decision/Final Notice of Sale and Terms (AS 38.05.948(a)(4)) Alaska Coastal Management Program Consistency Determination
S = Sale

U. S. DEPARTMENT OF THE INTERIOR

FINAL 5-YEAR OCS OIL & GAS LEASING PROGRAM

APRIL 1987



• Frontier Exploration Sale. Request for interest will be issued if necessary.

R - Request for Interest C - Call for Information & Nominations D - Comments on Call Due
A - Area Identification E - Draft EIS H - Public Hearing F - Final EIS
I - Issue Environmental Assessment for Supplemental Sale P - Proposed Notice of Sale
G - Governor's Comments Due N - Notice of Sale S - Sale

Attachment 1

TESTIMONY OF
WILLIAM D. VAN DYKE
BEFORE THE
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
October 13, 1987

Mr. Chairman, and members of the Committee:

My name is William D. Van Dyke. I am a petroleum engineer with nine years of experience in Alaska. I serve as Petroleum Manager for the Division of Oil and Gas in the Department of Natural Resources. I am actively involved in the permitting of oil and gas activities on State lands, unitization of State oil and gas leases, and design of the terms and conditions attached to State oil and gas leases at the time of sale. I also have been very involved in developing the State position concerning proposed leasing of the coastal plain of the Arctic National Wildlife Refuge (ANWR).

Before discussing the details of possible ANWR development strategies and specific mitigation measures, I would like to stress four very important points. First, oil and gas leasing in Alaska is extremely important to both the State and the nation. Second, from the information I have seen, I am convinced that the coastal plain of ANWR is the most prospective unexplored petroleum province remaining in North America. Third, given what we have learned from our years of experience at Prudhoe Bay and along the TAPS line, I believe that oil and gas development can take place in ANWR with a minimal degree of impact to the environment. And fourth, an exploration-only policy should not be considered for ANWR.

The manner in which State North Slope oil and gas lessees conduct their business has certainly evolved since what might be termed the "early years" at Prudhoe Bay. Government agencies' understanding of North Slope oil field operations and of the arctic environment have likewise matured. Summertime cat trains over the tundra and long gravel airstrips at each and every exploratory well site are now only stories of the past. Large balloon-tired vehicles, ice roads and comprehensive planning reflect the technologies and tools of today.

We do not know everything that there is to know about the environment and the ecology of the coastal plain. Year by year our understanding of these matters is growing, and we are developing better and more effective mitigation techniques. Certainly that trend will continue in the future. We have seen a progression from the first development at Prudhoe Bay and TAPS construction in the 1970's to the more recent developments at the Kuparuk, Milne Point, Lisburne and Endicott fields. The improvements reflect the incremental knowledge and experience gained. What has been learned at these fields can be applied to future activities on the coastal plain.

Let me cite a few examples of the advances that have been made:

1. Typically, on the North Slope, numerous development wells are drilled from a single gravel pad. At Prudhoe Bay, the original development wells were about 120 feet apart from each other. At the Kuparuk Field and at Lisburne the wells are about 60 feet apart. At the new offshore Endicott field, those wells are only 10 feet apart, but this requires a specially modified drill rig. Overall, this closer well spacing means that drill sites can be much smaller for a

given number of wells; overall utilization of gravel is reduced and fewer square feet of tundra are covered.

2. Significant advances have also been made in 3-D seismic interpretation, directional drilling technology, and Measurement While Drilling (MWD) technology. Again, fewer drill sites may be needed, and the sites can be optimally located. Having some flexibility in being able to move the drill site allows sensitive habitats to be avoided, while at the same time the subsurface reservoirs can be properly developed and produced.

3. Development and operation of giant oil fields requires wide-ranging support activities. Drilling mud and cement companies, construction contractors, well service operators, and the like, are all a necessary part of the day-to-day operation. As with the actual in-field operations, we are now much more experienced in planning for the needs of the service companies. The Kuparuk River Oil Field, with its associated Kuparuk Industrial Center, is a contemporary example of how to plan and permit these types of activities. We made some early mistakes at Prudhoe Bay, but we learned from those mistakes.

Certainly development of oil and gas on the coastal plain will require some trade-offs. However, relative to what might have been required even just 10 years ago, the magnitude of those trade-offs has been significantly diminished and in some cases even eliminated. Through a combination of innovative thinking, close observation of the actual effects caused by development, and pure scientific study, we are in a position today to say oil exploration and development can proceed in ANWR without significant adverse impact.

I believe an exploration-only policy in ANWR would be a big mistake for this country.

An exploration-only policy would cost the Federal government a lot of money. These costs would take several forms. The operation of an exploratory program would result in sizeable out-of-pocket government expenditures. Secondly, the government would forego lease and bonus revenues. And thirdly, such a program could effectively condemn adjacent acreage, and the attendant revenues that could flow from that property.

The National Petroleum Reserve (NPRA) is a prime example of a government-sponsored exploration program and the problems inherent in such a program. Between 1923 and 1953 the United States Navy drilled 37 test wells and found three oil accumulations and six gas accumulations within the NPRA. Only two of these discoveries were considered sizeable. This 30-year exploration effort cost the Federal government between $50 and $60 million.

In 1974, exploration began again in the NPRA, this time under the direction of the U.S. Geological Survey. Between 1974 and 1981 twenty-seven exploratory wells were drilled within the NPRA at a cost to the Federal government just over a half billion dollars. After the Federal exploration program ended, Congress authorized competitive leasing in NPRA, and three sales were held. The first two of these sales received minimal interest, and the third received no bids.

If the NPRA had been leased under a traditional competitive leasing program not only would it likely have generated millions of dollars of bonus revenues, but the exploration costs would have been borne by the oil industry.

Additionally, an exploration-only policy raises a number of technical issues. One issue is how many wells are necessary to confirm (or condemn) the region's resource potential. In the ANWR coastal plain, where the subsurface geology is extremely complex, it will require a very large number of exploratory wells (each at a high cost) to evaluate all the geologic plays which have the potential to yield commercial deposits. The drilling of six to 12 unsuccessful exploratory wells will not establish, with a high degree of confidence, that no commercial oil deposits exist in the 1002 area. The problem, as I see it, is that exploratory wells reveal more about the subsurface geology and oftentimes indicate additional plays and stratigraphic intervals that warrant evaluation. More questions are created than are answered. With a limited exploratory well program, the possibility exists that the area will be falsely condemned without the complete and thorough evaluation a more traditional leasing and exploration program would provide.

A traditional competitive leasing program results in many companies participating in the evaluation of different plays. One entity (the USGS, the State, or an individual company) cannot generate as many different interpretations from these data (or novel ideas for potential deposits) as a group of companies. Thus, the exploration-only proposal limits not only the number, but the types of plays that will be evaluated, further increasing the possibility that deposits could be missed.

In the case of a well (or wells) that is successful, various land management decisions and conflicts will arise related to the dispensation of the unleased lands. In most cases it requires a number of delineation wells to determine the size of a discovery--who will incur the cost of the delineation wells? How will leasing of partially known deposits be managed? These are problems that are not present with a competitive leasing regime.

With respect to the design of mitigation measures, both our leasing and permitting systems use a formal tri-agency review procedure to assure that lease sale proposals and permit applications receive a broad and a thorough review. The Alaska Department of Fish and Game (ADF&G), the Alaska Department of Environmental Conservation (ADEC), and the Alaska Department of Natural Resources (ADNR) each provide comments on the proposal. No single State agency has veto power, and conflicts between agencies are elevated--when necessary--to agency directors or commissioners for final resolution. We also solicit input from the Federal resource agencies, the oil industry and the people living in the sale area.

Given the scope and complexity of oil field operations and the broad range of environmental concerns at hand, I cannot imagine any one State or Federal agency possessing the expertise that is needed to properly review and approve all the terms of sale that might be used for the leasing of the coastal plain or, for approval of a proposal to develop a major new oil field in the coastal plain.

In my view, joint State-Federal multiagency review is a necessity at both the lease sale planning stage and during the actual permitting process. The State has also recommended joint State-Federal monitoring and enforcement teams be created. This will be essential in ANWR where Federal, State and fee ownership of subsurface mineral rights is a certainty, and permitting jurisdictions overlap.

Our terms of sale are a mixture of general performance standards and very site-specific requirements. We have taken this approach for a number of reasons. First, it is impractical to go out into the field ahead of time and gather the enormous amount of site-specific baseline data

that would be needed to write detailed all-encompassing stipulations for each and every square foot of proposed lease sale area. Second, in our lease sale areas, we are not absolutely certain where the oil and gas is located and what volumes might be there. We therefore cannot anticipate ahead of time the exact location or optimum layout of roads, pipelines, well sites, etc. Because of these two factors it is best to let the potential lessees know at the time of sale the parameters within which they will be expected to operate, while we retain the flexibility later in the process to fine-tune the proposals as they are developed.

In those areas where we have more detailed information (such as along the major North Slope river systems) or for those concerns that are well recognized (such as seasonal protection of caribou calving areas), we do draft very detailed site-specific measures. If you have the studies and the data in hand, it is only fair to let the lessees know that very specific restrictions will apply in certain areas or during certain times of the year.

But in those instances where the data are sketchy or nonconclusive or if there is a choice of possible mitigation measures, I believe it is a mistake at the lease sale stage to lock in rigid stipulations that later may turn out to be ineffective or unnecessary.

Recent exploration on the Federal OCS in Alaska and on State lands has been very disappointing. Our aggregate North Slope oil reserves are about half gone, and Cook Inlet production is well past its zenith. In reality, very few giant oil fields are ever discovered, but the ones that are found account for about two-thirds of all the oil produced. Because of the development at the Prudhoe Bay, Kuparuk, Milne Point, Lisburne, and Endicott fields, we have safe, proven technology. In terms of being able to plan and design for protection of biological resources, we are over the major hurdles that a major development proposal might present.

Prudhoe Bay currently provides over 20% of this Nation's domestic production. As that area moves into decline, ANWR represents this country's best opportunity to supplement those reserves. With the 10-15 year lead time necessary for exploration and development in the Arctic, this is the ideal time to begin a competitive ANWR leasing program. The State of Alaska stands ready and willing to work with the committee as it considers this important legislation.

We will be happy to provide the specific information you need on our current North Slope leasing and permitting practices, and our ideas on specific mitigation measures for ANWR.

For the record, along with my written testimony, I have submitted copies of three of our recent State notices of sale which list sale terms and conditions representative of those used to lease State acreage adjacent to ANWR. Sale 51 was an onshore sale. Sale 50 was an offshore sale. Sale 54 is an onshore sale proposed for January 1988. The notices for sales 50 and 51 contain the complete set of sale terms and conditions the State applied. The notice for Sale 54 is still in the preliminary stage, but you can see where we are headed in terms of mitigating measures for that area. There is no need to go through those notices page by page. Rather, I believe it is important for you to understand how we arrived at the final product, and the rationale behind those sale terms.

We are submitting the first stage of a lease sale stipulation review and analysis study that the State has undertaken. The study is being done to reassess the costs

and the benefits of each stipulation given the advances that have been made over the past few years.

Additionally, a summary of the different leasing methods the State currently has the authority to use is included.

Thank you for the opportunity to testify today and I will be happy to answer any questions.

Attachment 2

TESTIMONY OF KENNETH R. WHITTEN,
BEFORE THE HOUSE COMMITTEE ON
MERCHANT MARINE AND FISHERIES
March 3, 1988

Mr. Chairman and members of the Committee:

My name is Kenneth R. Whitten. I am a Research Biologist with the Alaska Department of Fish and Game in Fairbanks, Alaska. I have been working with the Porcupine Caribou Herd since 1978.

INTRODUCTION

The Porcupine Caribou Herd (PCH) is a significant international resource. Its lengthy migrations are an impressive ecological event and an important link in the northern Alaska and Yukon wildlife and human ecosystem. Several Indian and Eskimo communities on both sides of the border rely heavily on the PCH for subsistence.

During their annual cycle, pregnant cows of the PCH migrate to the coastal plain in Alaska and northwestern Canada to calve. Although some calving likely occurs over most of the coastal plain, calving concentrations are readily apparent in some areas. The concentration area which has been most frequently and heavily used has been called the "core" calving area.

The PCH also forms huge post-calving aggregations. These aggregations move extensively within the coastal plain and foothills to gain relief from mosquitoes and other insect pests. Biologists believe that unrestricted access to these relief areas is important to the herd's well-being.

The State of Alaska is concerned that oil and gas development in the 1002 area of the Arctic National Wildlife Refuge (ANWR) could adversely affect use of calving areas. We have recommended that approximately 15% of the 1002 area, that portion delineated in the draft 1002 report as the "core" calving area, be deferred from leasing for ten years. During this moratorium, a seven-year research program would be undertaken to improve our understanding of the importance of this core calving area, to assess the effects that oil development may have on use of the area, and to develop appropriate mitigative measures.

In addition, in order to mitigate the effect of development on the use of early summer habitat, we have recommended that, within three miles of the coast, only those facilities that cannot be sited elsewhere be allowed. We have also recommended that a study be undertaken to evaluate the responses of large aggregations to a road/pipeline simulation

and to develop measures that would assure free passage of these aggregations.

The objective of the approach described here is to ensure the viability of the Porcupine Caribou Herd. I want to emphasize, however, that there may be other ways to achieve this objective. We remain open to hearing other ideas which may accomplish this end. The State would like to work with this committee to develop an approach which will foster exploration and development of the oil and gas potential of the coastal plain while protecting the Porcupine Caribou Herd.

THE CENTRAL ARCTIC HERD EXPERIENCE

Before considering the distribution of the PCH within the ANWR coastal plain, I will review the status of knowledge on the responses of the Central Arctic Herd (CAH) to petroleum development in the Prudhoe Bay area and comment on the relevance of those observations to the ANWR issue. I will discuss the effect of development on habitat use and population size sequentially. As the principal concerns for both herds currently apply only to calving and midsummer, the discussion will be restricted to those two periods.

Habitat Use

Results of aerial surveys over the past ten years indicate that the majority of the CAH, like other arctic herds in North America, calves predictably in certain specific areas--primarily near Milne Point and the Canning Delta (Fig. 1), but also in the adjacent uplands to the south. When spring snowmelt is late, relatively more calving occurs in inland areas than in coastal regions. In the "average" year, however, most parturient cows are found in coastal concentrations.

Estimates of caribou density have been made during the calving period for various regions between the Colville and Canning Rivers. The results show that densities within the area encompassing the Prudhoe Bay oilfield complex have been less than one-half of the next lowest density area and less than one-tenth of the highest density area. While there is little reason to believe that the immediate Prudhoe Bay area previously supported particularly high densities of calving caribou (i.e., on the order of those near Milne Point or the Canning Delta), we believe that reduced calving in that area is due to the presence of a major oilfield complex.

Statistically significant changes in calving distribution have been observed in the vicinity of the Milne Point oilfield complex, west of Prudhoe Bay. A comparison of caribou distribution during the four years prior to construction with that during the four years after road placement

indicates that only half as many cows and calves used the area within two miles of the road right-of-way after the road was built. The logical implication of these results is that an extensive, dense network of transportation corridors may well result in widespread loss of calving habitat. In hindsight, we believe that this is precisely what occurred in the Prudhoe Bay complex as it grew from a minor oilfield with minimal support facilities in the early 1970's, to a large development center. Additional losses of calving habitat within the traditional concentration area west of Prudhoe Bay may be forthcoming as the Kuparuk and Milne Point oilfields continue to expand to their full recovery potential. Figure 2 depicts the regional growth of oil-related development that has occurred in only 12 years.

The second of our major concerns involves a decline in the use of developed areas during midsummer. During this period, caribou must maximize nutrient intake to promote growth and fattening, and, in the case of maternal females, to meet the metabolic demands of lactation. It is generally believed that failure to attain a minimum standard of body condition by autumn may result in reduced reproductive performance of females and predispose calves to higher rates of mortality.

The summer grazing process is complicated considerably by the frequent appearance of insect pests, which become active during warm, calm periods. Caribou of the CAH respond to insect attack by aggregating and moving rapidly to coastal areas where lower temperatures and higher winds discourage insect activity. With an abatement of insect attack, caribou disperse and drift inland to preferred feeding areas. Thus, numerous movements may occur between coastal insect relief habitat, where energy expenditure can be minimized, and inland foraging areas, where energy intake can be maximized. The result, in theory, is a net increase in energy retention. We therefore believe that unrestricted summer movements are of considerable importance.

Unfortunately, our experience in the Prudhoe Bay area over the past decade suggests that maintaining the functional integrity of caribou summer range might not be possible, given the widespread surface use requirements for oil and gas development. Overall caribou density within the oilfield complex during summer is considerably lower than in adjacent areas, and cows and calves are not present in normal numbers. Apparently, industrial growth of the area has also greatly restricted the east-west summer movements of caribou. In the late 1960's and early 1970's, several authors reported the passage of large groups (i.e., in the thousands) through what is now the main oilfield complex. Since the late 1970's, however, there has been little movement of caribou through this complex. The known movements of numerous radio-collared caribou confirm this observation.

Recent observations suggest that CAH caribou are experiencing difficulty gaining access to various components of summer range within the Kuparuk and Milne Point oilfields. As oil development in the region continues to expand and intensify, large portions of habitat may become inaccessible. Thus far, however, caribou have continued to occupy the general region in moderate numbers, despite localized abnormalities in distribution and the impediments to movement posed by an increasingly complex system of roads and pipelines. But the future is uncertain with respect to continual use of this portion of CAH summer range.

Population Size

The CAH has undergone rapid growth during the period of oil development in the Prudhoe Bay area--from 6,000 in 1978 to an estimated 16,000 at present, in spite of the effects on habitat use discussed above. The following factors may account for the increase in herd size.

1. Only a small percentage of the total calving and summer range has been affected to date, and it appears that suitable alternative areas remain available.

2. Wolves, a major predator of caribou, were sharply reduced in the region in the late 1970's.

3. Hunter harvest has been generally low.

4. Winter weather has been generally favorable.

5. Summer insect activity has been low to moderate--at least in recent years.

6. Mitigative measures have been incorporated into the Kuparuk and Milne Point oilfields in the form of modified pipeline configurations, special crossing structures, and some restrictions on traffic.

Favorable environmental factors, some of which are short-term, make it impossible to determine what effect development has had on the long-term health of the Central Arctic Herd.

Experiences with the CAH provide the primary basis for predicting the responses of PCH caribou to oil development. However, we believe that the two herds are not entirely comparable in terms of susceptibility to disturbance, owing to differences in herd size and the distribution of seasonal habitats. In contrast to the apparently numerous habitat options available to the CAH, the PCH has relatively few. Quite simply, with a narrower coastal plain within ANWR, less calving habitat is available to the PCH--an effect that

is compounded by its greater size. The net result is less flexibility in the use of calving areas. Also, the PCH typically forms huge aggregations in midsummer. These are frequently on the order of 50,000-80,000 animals, far larger than those of the CAH, which tend to number only 3,000-4,000 at maximum. Recent work on the CAH indicates that large groups have considerably more difficulty negotiating roads and pipelines than small groups, but it is impossible to predict at this time how the extremely large aggregations of the PCH would react to production facilities, roads and pipelines, and human activity characteristic of oilfields, much less the long-term consequences to the population of serious perturbations in distribution and movements that might occur as a result. Also, the PCH would contact industrial development on the coastal plain for only a brief period each year (i.e., less than 2 months), and might therefore react more strongly to disturbance stimuli than CAH caribou. That is, the PCH may be relatively "naive," and predictions based on CAH responses may underestimate the impacts on caribou within ANWR.

On the other hand, much of the knowledge gained on the CAH over the past ten years should apply rather well to the PCH. For example, there is little reason to expect that the qualitative responses of PCH females during calving will be markedly different from those documented for CAH females; we can anticipate similar avoidance responses to linear structures placed within calving areas. And we now know from work on the CAH that heavy traffic on roads, in close proximity to elevated pipelines, reduces caribou crossing success. Mitigation strategies, such as buried pipelines, road/pipeline separations, and strict traffic restrictions could be effective on both herds.

THE PORCUPINE CARIBOU HERD

The PCH occupies three fairly distinct wintering areas in Alaska and western Canada: The vicinity of Arctic Village and Venetie, the Richardson Mountains, and the Ogilvie Mountains/upper Peel River. In spring, pregnant females move northward along three principal routes, known as the Old Crow, Richardson, and Chandalar routes. The onset of spring migration, the particular route selected, and rate of travel are highly dependent on regional snow conditions and the wintering area occupied. Movements appear to be highly "purposeful," in that cows delayed by adverse snow conditions compensate by subsequently traveling faster (often 20-30 km/day) when conditions improve. The initial destination appears to be a "staging area" along the lower Firth River in Canada, which is often snow-free earlier than other areas to the west. If snow conditions are generally favorable on the coastal plain, cows will continue westward to the main calving area in the Jago Uplands. Some calving occurs elsewhere on the coastal plain, creating the false impression

of a broad continuum of calving activity; but in the overwhelming majority of years for which adequate records are available, a large calving concentration was clearly apparent between the Hulahula and Aichilik Rivers.

After calving, the bulls and yearlings, which slowly follow the northward progression of snow-melt and "green-up," join the cows and newborn calves. Large mixed aggregations (in the tens of thousands) form on or near the main calving area and move extensively within the coastal plain, frequently under the influence of insect harassment. By mid-July most of these aggregations have moved eastward along the coast into Canada, although variable numbers of caribou move directly through the mountains, thence to midsummer ranges in Canada or on the south slopes of the eastern Brooks Range. In late summer, caribou begin a drift toward wintering areas, completing the annual cycle of movement.

The central issue here is the location and use of a discrete calving area by the PCH. It should be emphasized that the concept of traditional calving areas is not new. Since the 1960's, caribou herds have been identified on the basis of their use of a common calving ground. Such areas have been described for most Alaskan and Canadian herds, and several herds in the Soviet Union as well. The available data on many herds indicate that there are areas of concentrated calving within traditional calving grounds. Those concentration areas occupied most frequently in high density are known as "core" calving areas.

Unfortunately, much of the information on the past distribution and movements of the PCH is difficult to interpret. Survey methodologies employed over the years have been extremely variable in terms of timing, overall effort, type and number of aircraft used, and the availability of radio-collared caribou. Also, many early surveys yielded data that are of marginal usefulness in addressing the present issue. Surveys since 1982 were designed for the express purpose of closely monitoring movements, determining actual calving sites, and delineating calving concentrations. We now routinely employ satellite-tracking technology and conventional radio-telemetry techniques as integral components of our field program.

In spite of recent improvements in our surveillance capabilities, virtually all data on PCH calving distribution are principally qualitative and descriptive. Some progress has been made in quantifying the occurrence of caribou in various areas, but precise density figures are still lacking, and boundaries are based largely on subjective judgment.

A second problem lies in the dynamics of the calving process itself, in that a changing situation is extremely difficult

to describe using point-in-time measurements. Calving occurs continuously over roughly a two-week period, during which an individual female caribou may be both highly mobile and nearly sedentary. Thus, at any given time during the calving period, some pregnant females are enroute to actual calving sites, others with new calves are relatively stationary, and still others with older calves may be undergoing moderate movements characteristic of the post-calving phase. For this reason, survey results obtained early in the calving period may be more a reflection of movements into calving areas than the distribution of caribou during calving per se; similar errors are likely if surveys are conducted too late in the calving period.

Such problems in the design and timing of surveys, together with other unknowns regarding the completeness and quality of coverage, place severe limitations on reinterpreting much of the early information on calving distribution of the PCH. In fact, considerable care must be taken to avoid refining the analyses beyond the inherent precision of the original data. These and other restrictions preclude a totally precise delineation of calving concentrations for any given year.

Nevertheless, consistencies in calving distribution do emerge when 16 years' data are superimposed graphically. Even the most cursory examination reveals a clear pattern of recurrent--albeit not exclusive--use of the Jago Uplands, between the Hulahula and Aichilik Rivers (Fig. 3). In more than 90% of the annual observations, this area included a calving concentration. Furthermore, in more than 60% of the years for which estimates of relative caribou abundance were reported, the Jago Uplands supported more calving caribou than any other area within the PCH range (Table 1).

The "core" calving area, as defined in the draft 1002 report, lies within the Jago Uplands. The core area describes the zone of heaviest use for calving, based on a thorough examination of all available data. In addition, participants at a 1985 caribou workshop sponsored by USFWS agreed that this core area best describes a common zone of concentrated calving activity, and that it is of sufficient size to accommodate the majority of calving caribou in the herd.

Recurrent, heavy use of certain calving areas implies a strong preference, and the persistence of such a tradition implies a net benefit to the herd in terms of calf production and survival. Among the possible attributes of calving concentration areas are:

1. A relative scarcity of predators.

2. Early snow ablation with locally advanced forage availability.

3. Proximity to insect relief habitat.

Most likely, several factors are instrumental in sustaining an affinity for certain specific calving areas, and all may not be important in a given year. It is conceivable that, from an evolutionary point of view, the tradition is retained primarily to offset the effects of exceptionally adverse conditions, perhaps in the form of heavy predation or deep snow during the previous winter; the periodic advantages derived from certain habitats would therefore tend to buffer fluctuations in the herd. The overall benefits to the PCH may be extremely subtle, but nonetheless important to the long-term well-being of the population.

INFORMATION NEEDS

The State has recommended that leasing in the core calving area be deferred for a ten-year period. During this moratorium, a research program would be undertaken that consists of four main components:

1. To evaluate the physical and biological characteristics of core and peripheral calving areas; features such as the vegetation, topography, meteorology, predator abundance, predation rates, and caribou use would be compared between core and peripheral areas.

2. To evaluate the effects of oil development on caribou calving distribution; because oil development would not occur within the core calving area of the PCH, this evaluation would rely on the continuation of the long-term study of the CAH, and especially the responses of calving caribou to continued development in the Kuparuk oilfield.

3. To evaluate the effects of oil development on insect-induced movements, particularly movements of the extremely large groups that commonly occur in the PCH; this component would focus on the responses of such large groups to a simulated transportation system, as well as analyzing the bioenergetics of such movements.

4. To characterize the caribou harvest in villages within the range of the PCH, principally Kaktovik and Arctic Village; this baseline information

would be used in evaluating the effects of oil development on subsistence use of caribou.

We believe that the results of this research program would improve our understanding of the importance of the core calving area to the PCH, and would improve our ability to predict the potential effects of oil development on the herd, thereby providing a more informed basis for recommending mitigative measures.

TABLE 1. YEAR-BY-YEAR ANALYSIS OF CALVING DISTRIBUTION OF THE PORCUPINE CARIBOU HERD.

Year	Jago Uplands[1] Used?	Most Used?	Confidence Rating	Survey Methods	Investigators
1972	Yes	--	Low		RRCS[2], ADF&G
1973	Yes	Yes	Low		RRCS
1974	Yes	No	Low	Nonsystematic aerial surveys; infrequent	RRCS
1975	Yes	Yes	Low-medium	flights; no radio collars	RRCS
1976	Yes	--	Low-medium		RRCS
1977	Yes	--	Low-medium		RRCS
1978	Yes	Yes	Medium	Systematic aerial transect surveys	YGB[3]
1979	Yes	Yes	Medium	including density estimates; few	YGB
1980	Yes	No	Medium	radio collars (12); infrequent	YGB
1981	Yes	Yes	Medium	relocations	YGB
1982	No	No	High		ADF&G, USFWS
1983	Yes	Yes	High	Daily aerial surveys with	ADF&G, USFWS
1984	Yes	Yes	High	frequent relocations of many	ADF&G, USFWS
1985	Yes	Yes	High	(20-80) radio-collared cows	ADF&G, USFWS
1986	Yes	No	High		ADF&G, USFWS
1987	Yes	No	High		ADF&G, USFWS

CONCLUSIONS: The Jago Uplands were used as a concentrated calving area over 90% of the time. The Jago Uplands area was the most heavily used area for calving within the Porcupine Caribou Herd range over 60% of the time.

[1] Coastal plain/foothill area between Hulahula and Aichilik Rivers; the "core calving area", as defined in the draft 1002 report, falls within this area.

[2] Renewable Resources Consulting Services

[3] Yukon Game Branch

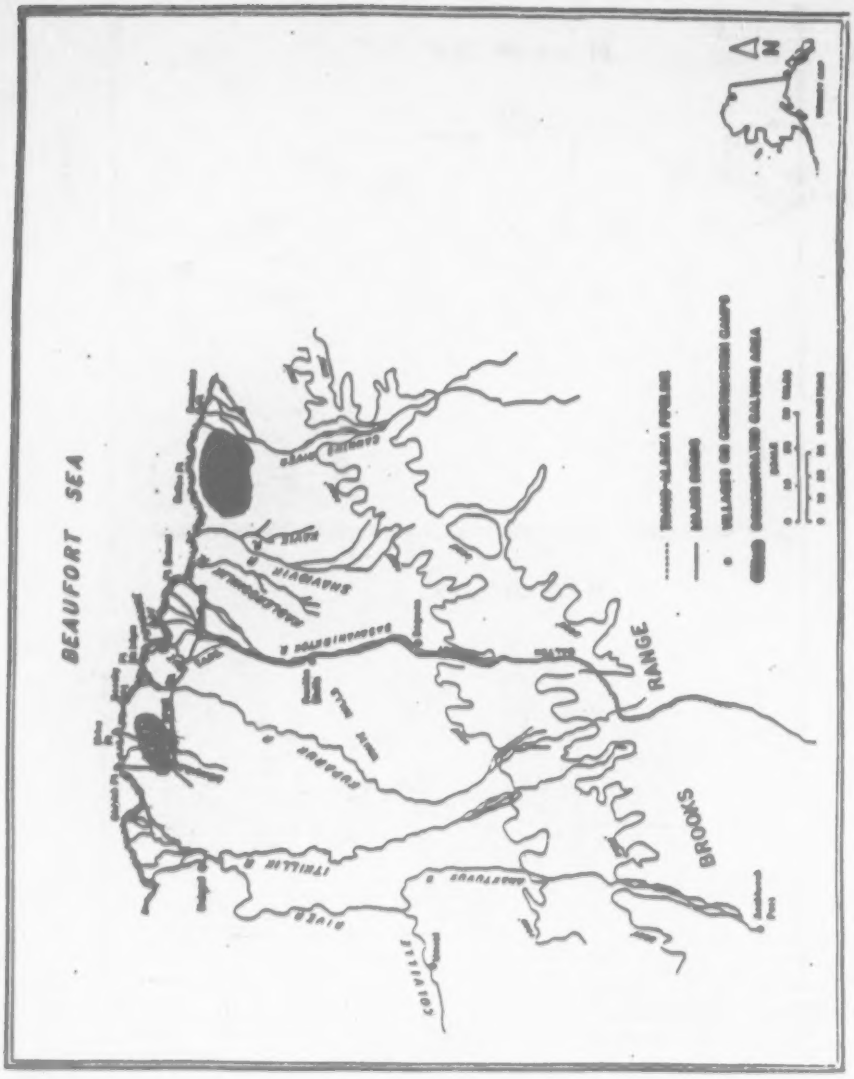


FIGURE 1.

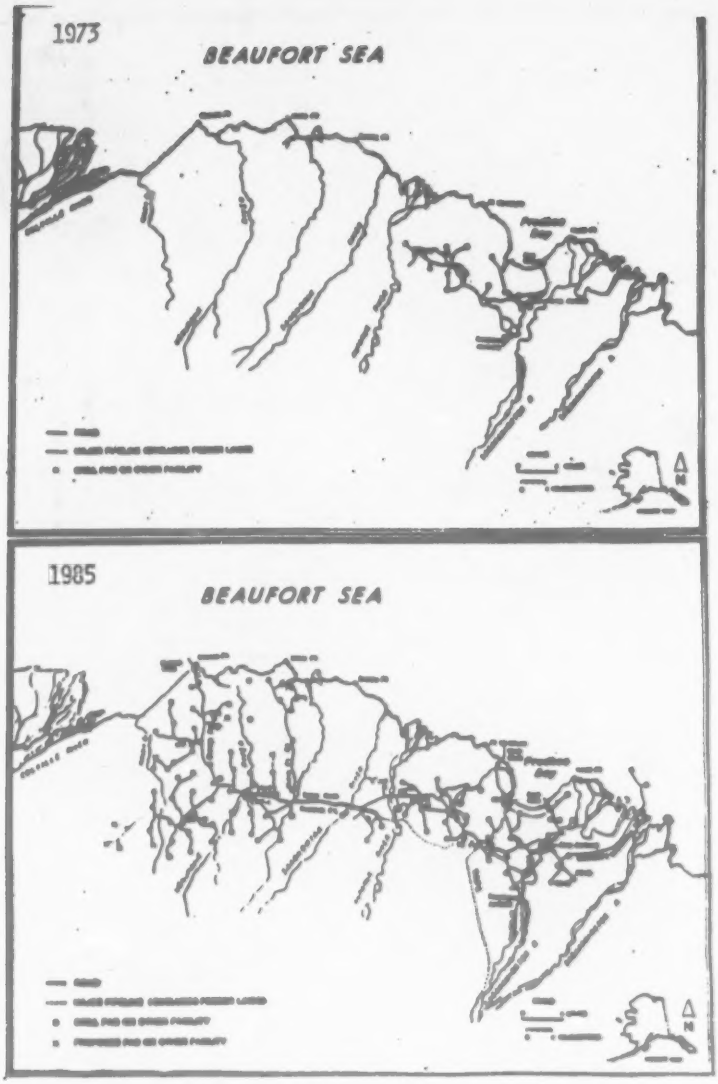


FIGURE 2.

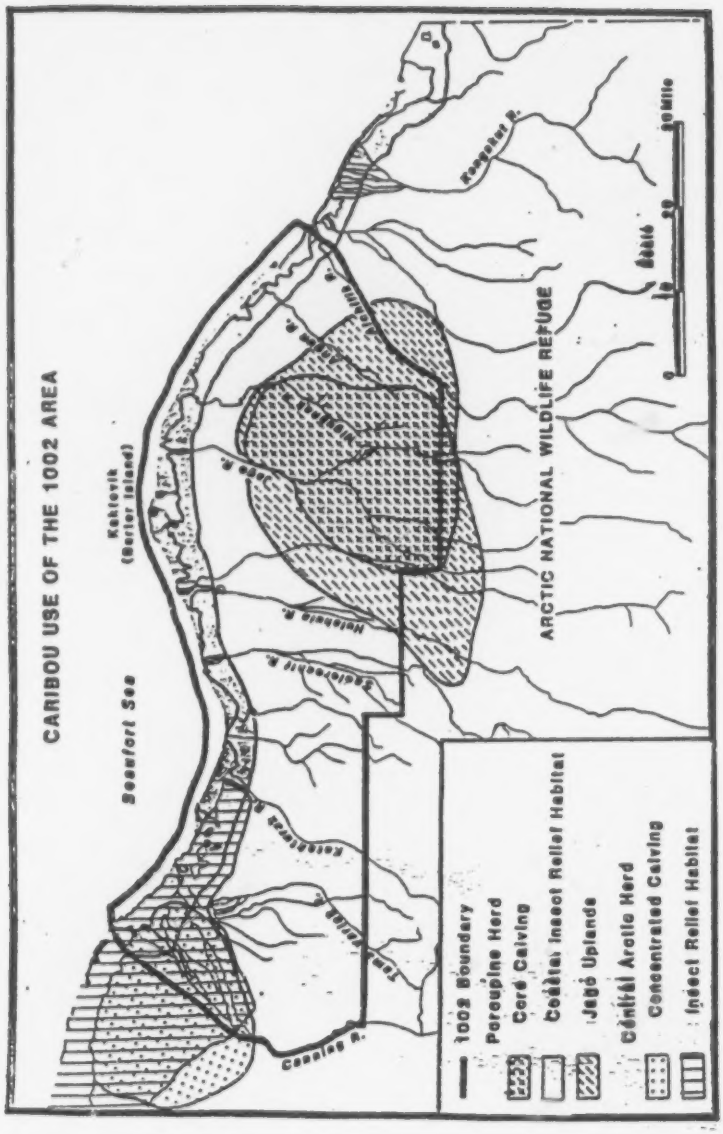

CARIBOU USE OF THE 1002 AREA
Beaufort Sea
Kaktovik
(Barter Island)
ARCTIC NATIONAL WILDLIFE REFUGE
Canning R.
Hulahula R.
Kongakut R.
Aichilik R.
Egaksrak R.
Okpilak R.
Jago R.
Katakturuk R.
Kongakut R.
Miles
1002 Boundary
Porcupine Herd
Core Calving
Coastal Insect Relief Habitat
Jago Uplands
Central Arctic Herd
Concentrated Calving
Insect Relief Habitat

FIGURE 3.

Attachment 2

TESTIMONY OF KEN WHITTEN
BEFORE THE HOUSE SUBCOMMITTEE
ON WATER AND POWER RESOURCES
October 22, 1987

Mr. Chairman and members of the SubCommittee:

My name is Ken Whitten. I am a game biologist for Interior Alaska for the Alaska Department of Fish and Game.

INTRODUCTION

The Porcupine Caribou Herd (PCH) is a significant international resource. Its lengthy migrations are an impressive ecological event and an important link in the Northern Alaska and Yukon wildlife and human ecosystem. Several Indian and Eskimo communities on both sides of the border rely heavily on the PCH for subsistence.

During their annual cycle, pregnant cows of the PCH migrate to the coastal plain in Alaska and northwestern Canada to calve. Although some calving likely occurs over most of the coastal plain, calving concentrations are readily apparent in some areas. The concentration area which has been most frequently and heavily used has been called the "core" calving area.

The PCH also forms huge post-calving aggregations. These huge aggregations move extensively within the coastal plain and foothills to gain relief from mosquitoes and other insect pests. Biologists believe that unrestricted access to these relief areas is important to the herd's well-being.

The State of Alaska is concerned that oil and gas development in the 1002 area of the Arctic National Wildlife Refuge (ANWR) could adversely affect use of calving areas. We have recommended that approximately 15% of the 1002 area, that portion delineated in the draft 1002 report as the "core" calving area, be deferred from leasing for ten years. During this moratorium, a seven-year research program would be undertaken to improve our understanding of the importance of this core calving area, to assess the effects that oil development may have on use of the area, and to develop appropriate mitigative measures.

In addition, in order to mitigate the effect of development on the use of early summer habitat we have recommended that, within three miles of the coast, only those facilities that cannot be sited elsewhere be allowed. We have also recommended that a study be undertaken to evaluate the responses of large aggregations to a road/pipeline simulation and to develop measures that would assure free passage of these aggregations.

The objective of the approach described here is to ensure the viability of the Porcupine Caribou herd. I want to emphasize, however, that there may be other ways to achieve this objective. We remain open to hearing other ideas which may accomplish this end. The State would like to work with the Interior Committee to develop an approach which will foster exploration and development of the oil and gas potential of the Coastal Plain while protecting the Porcupine Caribou herd.

THE CENTRAL ARCTIC HERD EXPERIENCE

Before considering the distribution of the PCH within the ANWR coastal plain, we will review the status of knowledge on the responses of the Central Arctic Herd (CAH) to petroleum development in the Prudhoe Bay area and comment on the relevance of those observations to the ANWR issue. We will discuss the effect of development on habitat use and

population size sequentially. As the principal concerns for both herds currently apply only to calving and midsummer, the discussion will be restricted to those two periods.

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Additional abnormalities in calving distribution have been observed in the vicinity of the Milne Point oilfield complex, west of Prudhoe Bay. A comparison of caribou distribution during the four years prior to construction with that during the four years after road placement indicates that only half as many cows and calves used the area within two miles of the road right-of-way after the road was build. The logical implication of these results is that an extensive, dense network of transportation corridors may well result in widespread loss of calving habitat. In hindsight, we believe that this occurred in the Prudhoe Bay complex as it grew from a minor oilfield with minimal support facilities in the early 1970's, to a large development center. Additional losses of calving habitat within the traditional concentration area west of Prudhoe Bay may be forthcoming as the Kuparuk and Milne Point oilfields continue to expand to their full recovery potential. Figure 2 depicts the regional growth of oil-related development that has occurred in only 12 years.

The second of our major concerns involves a decline in the use of developed areas during midsummer. During this period, caribou must maximize nutrient intake to promote growth and fattening, and, in the case of maternal females, to meet the metabolic demands of lactation. It is generally believed that failure to attain a minimum standard of body condition by autumn may result in reduced reproductive performance of females and predispose calves to higher rates of mortality.

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Population size

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1. Only a small percentage of the total calving and summer range has been affected to date, and it appears that suitable alternative areas remain available.

2. Wolves, a major predator of caribou, were sharply reduced in the region in the late 1970's.

3. Hunter harvest has been generally low.

4. Winter weather has been generally favorable.

5. Summer insect activity has been low-to-moderate--at least in recent years.

6. Mitigative measures have been incorporated into the Kuparuk and Milne Point oilfields in the form of modified pipeline configurations, special crossing structures, and some restrictions on traffic.

Favorable environmental factors, some of which are short-term, make it impossible to determine what affect development has had on the long-term health of the Central Arctic Herd.

Experiences with the CAH provide the primary basis for predicting the responses of PCH caribou to oil development. However, we believe that the two herds are not entirely comparable in terms of susceptibility to disturbance, owing to differences in herd size and the distribution of seasonal habitats. In contrast to the apparently numerous habitat options available to the CAH, the PCH has relatively few. Quite simply, with a narrower coastal plain within ANWR, less calving habitat is available to the PCH--an effect that

is compounded further by its greater size. The net result is less flexibility in the use of calving areas. Also, the PCH typically forms huge aggregations in midsummer. These are frequently on the order of 50,000-80,000 animals, far larger than those of the CAH, which tend to number only 3,000-4,000 at maximum. Recent work on the CAH indicates that large groups have considerably more difficulty negotiating roads and pipelines than small groups, but it is impossible to predict at this time how large aggregations of the PCH would react to production facilities, roads and pipelines, and human activity characteristic of oilfields, much less the long-term consequences to the population of serious perturbations in distribution and movements that might occur as a result. Also, the PCH would contact industrial development on the coastal plain for only a brief period each year (i.e., less than 2 months), and might therefore react more strongly to disturbance stimuli than CAH caribou. That is, the PCH may be relatively "naive," and predictions based on CAH responses may underestimate the impacts on caribou within ANWR.

On the other hand, much of the knowledge gained on the CAH over the past ten years should apply rather well to the PCH. For example, there is little reason to expect that the qualitative responses of PCH females during calving will be markedly different from those documented for CAH females; we can anticipate similar avoidance responses to linear structures placed within calving areas. And we now know from work on the CAH that heavy traffic on roads, in close proximity to elevated pipelines, reduces caribou crossing success. Mitigation strategies, such as buried pipelines, road/pipeline separations, and strict traffic restrictions could be effective on both herds.

THE PORCUPINE CARIBOU HERD

The PCH occupies three fairly distinct wintering areas in Alaska and western Canada: The vicinity of Arctic Village and Venetie, the Richardson Mountains, and the Ogilvie Mountains/upper Peel River. In spring, pregnant females move northward along three principal routes, known as the Old Crow, Richardson, and Chandalar routes. The onset of spring migration, the particular route selected, and rate of travel are highly dependent on regional snow conditions and the wintering area occupied. Movements appear to be highly "purposeful," in that cows delayed by adverse snow conditions compensate by subsequently traveling faster (often 20-30 km/day) when conditions improve. The initial destination appears to be a "staging area" along the lower Firth River in Canada, which is often snow-free earlier than other areas to the west. If snow conditions are generally favorable on the coastal plain, cows will continue westward to the main calving area south of Barter Island. Some calving occurs elsewhere on the coastal plain, creating the false impression of a broad continuum of calving activity; but in the overwhelming majority of years for which adequate records are available, a large calving concentration was clearly apparent between the Hulahula and Aichilik Rivers.

After calving, the bulls and yearlings, which had slowly followed the northward progression of snow-melt and "green-up," join the cows and newborn calves. Large mixed aggregations (in the tens of thousands) form on or near the main calving area and move extensively within the coastal plain, frequently under the influence of insect harassment. By mid-July most of these aggregations have moved eastward along the coast into Canada, although variable numbers of caribou move directly through the mountains, thence to midsummer ranges in Canada or on the south slopes of the eastern Brooks Range. In late summer, caribou begin a drift toward wintering areas, completing the annual cycle of movement.

The central issue here is the location and use of a discrete calving area by the PCH. It should be emphasized that the concept of traditional calving areas is not new. Since the 1960's, caribou herds have been identified on the basis of their use of a common calving ground. Such areas have been described for most Alaskan and Canadian herds, and several herds in the Soviet Union as well. The available data on many herds indicate that there are areas of concentrated calving within traditional calving grounds. Those concentration areas occupied most frequently in high density are known as "core" calving areas.

The survey methodologies employed over the years have been extremely variable in terms of timing, overall effort, type and number of aircraft used, and the availability of radio-collared caribou. Also, many early surveys yielded data that are of marginal usefulness in addressing the present issue. Surveys since 1982 were designed for the express purpose of closely monitoring movements, determining actual calving sites, and delineating calving concentrations. We now routinely employ satellite-tracking technology and conventional radio-telemetry techniques as integral components of our field program.

In spite of recent improvements in our surveillance capabilities, virtually all data on PCH calving distribution are principally qualitative and descriptive. Some progress has been made in quantifying the occurrence of caribou in various areas, but precise density figures are still lacking, and boundaries are based largely on subjective judgment.

A second problem lies in the dynamics of the calving process itself, in that a changing situation is extremely difficult to describe using point-in-time measurements. Calving occurs continuously over roughly a two-week period, during which an individual female caribou may be both highly mobile and nearly sedentary. Thus, at any given time during the calving period, some pregnant females are enroute to actual calving sites, others with new calves are relatively stationary, and still others with older calves may be undergoing moderate movements characteristic of the post-calving phase. For this reason, survey results obtained early in the calving period may be more a reflection of movements into calving areas than the distribution of caribou during calving *per se*; similar errors are likely if surveys are conducted too late in the calving period.

Such problems in the design and timing of surveys, together with other unknowns regarding the completeness and quality of coverage, place severe limitations on reinterpreting much of the early information on calving distribution of the PCH. In fact, considerable care must be taken to avoid refining the analyses beyond the inherent precision of the original data. These and other restrictions preclude a totally precise delineation of calving concentrations for any given year.

Nevertheless, consistencies in calving distribution do emerge when 16 years' data are superimposed graphically. Even the most cursory examination reveals a clear pattern of recurrent--albeit not exclusive--use of the Jago Uplands, between the Hulahula and Aichilik Rivers (Fig. 3). In more than 90% of the annual observations, this area included a calving concentration. Furthermore, in more than 60% of the years for which estimates of relative caribou abundance were reported, the Jago Uplands supported more calving caribou than any other area within the PCH range (Table 1).

The "core" calving area, as defined in the draft 1002 report, lies within the Jago Uplands. The core area

describes the zone of heaviest use for calving, based on a thorough examination of all available data. In addition, participants at a 1985 caribou workshop sponsored by USFWS agreed that this core area best describes a common zone of concentrated calving activity, and that it is of sufficient size to accommodate the majority of calving caribou in the herd.

Recurrent, heavy use of certain calving areas implies a strong preference, and the persistence of such a tradition implies a net benefit to the herd in terms of calf production and survival. Among the possible attributes of calving concentration areas are:

1. A relative scarcity of predators.

2. Early snow ablation with locally advanced forage availability.

3. Proximity to insect relief habitat.

Most likely, several factors are instrumental in sustaining an affinity for certain specific calving areas, and all may not be important in a given year. It is conceivable that, from an evolutionary point of view, the tradition is retained primarily to offset the effects of exceptionally adverse conditions, perhaps in the form of heavy predation or deep snow during the previous winter; the periodic advantages derived from certain habitats would therefore tend to buffer fluctuations in the herd. The overall benefits to the PCH may be extremely subtle, but nonetheless important to the long-term well-being of the population.

INFORMATION NEEDS

The State has recommended that leasing in the core calving area be deferred for a ten-year period. During this moratorium, a research program would be undertaken that consists of four main components:

1. To evaluate the physical and biological characteristics of core and peripheral calving areas; features such as the vegetation, topography, meteorology, predator abundance, predation rates, and caribou use would be compared between core and peripheral areas.

2. To evaluate the effects of oil development on caribou calving distribution; because oil development would not occur within the core calving area of the PCH, this evaluation would rely on the continuation of the long-term study of the CAH, and especially the responses of calving caribou to continued development in the Kuparuk oilfield.

3. To evaluate the effects of oil development on insect-induced movements, particularly movements of the extremely large groups that commonly occur in the PCH; this component would focus on the responses of such large groups to a simulated transportation system, as well as analyzing the bioenergetics of such movements.

4. To characterize the caribou harvest in villages within the range of the PCH, principally Kaktovik and Arctic Village; this baseline information would be used in evaluating the effects of oil development on subsistence use of caribou.

We believe that the results of this research program would improve our understanding of the importance of the core

calving area to the PCH, and would improve our ability to predict the potential effects of oil development on the herd, thereby providing a more informed basis for recommending mitigative measures.

Attachment 2

TESTIMONY OF DR. ALVIN G. OTT
BEFORE THE HOUSE SUBCOMMITTEE ON FISHERIES
AND WILDLIFE CONSERVATION AND THE ENVIRONMENT
March 3, 1988

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

MY NAME IS DR. ALVIN G. OTT. I AM THE REGIONAL SUPERVISOR OF THE HABITAT DIVISION WITH THE ALASKA DEPARTMENT OF FISH AND GAME IN FAIRBANKS, ALASKA.

THE TESTIMONY PRESENTED TODAY FOCUSES ON OIL AND GAS EXPLORATION AND PRODUCTION IN THE 1002 AREA OF THE ARCTIC NATIONAL WILDLIFE REFUGE (ANWR), AND SPECIFICALLY HOW ENVIRONMENTAL IMPACTS FROM LARGE SCALE DEVELOPMENT PROJECTS CAN BE MITIGATED BASED ON EXPERIENCES WITH OIL AND GAS PRODUCTION ON THE NORTH SLOPE OF ALASKA. THE STATE OF ALASKA HAS CONSIDERABLE EXPERTISE, PARTICULARLY THE ALASKA DEPARTMENT OF FISH AND GAME (ADF&G), IN TERMS OF POTENTIAL IMPACTS TO FISH AND WILDLIFE RESOURCES AND ACCEPTABLE MITIGATION WITH RESPECT TO OIL AND GAS EXPLORATION AND PRODUCTION.

IT IS IMPORTANT TO RECOGNIZE THE SCOPE AND MAGNITUDE OF OIL PRODUCTION, AS CONTRASTED WITH EXPLORATION. THE STATE OF ALASKA'S COMMENTS ARE BASED ON THE ASSUMPTION THAT IF AN AREA IS LEASED, PRODUCTION OF OIL AND GAS MAY OCCUR. WHILE EXPLORATORY ACTIVITIES ARE SEASONAL IN NATURE AND LIMITED IN SCOPE, OIL PRODUCTION IS AN ONGOING ACTIVITY WITH FACILITIES BEING ADDED CONTINUALLY.

IN ORDER TO EFFECTIVELY MITIGATE ADVERSE ENVIRONMENTAL EFFECTS OF OIL AND GAS, WE HAVE TAKEN THE FOLLOWING STEPS:

(1) A SIGNIFICANT AMOUNT OF INFORMATION HAS BEEN GATHERED BY THE U.S. FISH AND WILDLIFE SERVICE (USFWS) AND THE ADF&G OVER THE PAST FIVE YEARS ON THE DISTRIBUTION AND ABUNDANCE OF FISH AND WILDLIFE RESOURCES IN THE ANWR. THESE DATA HAVE BEEN REVIEWED AND ANALYZED WITH THE OBJECTIVE OF IDENTIFYING HABITATS OF SPECIAL CONCERN TO SELECTED SPECIES OF FISH AND WILDLIFE;

(2) DATA GAPS HAVE BEEN IDENTIFIED AND STUDIES RECOMMENDED TO FILL THESE DATA GAPS. FOR EXAMPLE, THE DEPARTMENT INITIATED A FISHERIES STUDY ON NORTH SLOPE GRAVEL PITS IN JULY OF 1986. RESULTS FROM THIS STUDY INDICATE THAT GRAVEL PITS FLOODED WITH WATER PROVIDE BOTH SUMMER AND WINTER HABITAT FOR A VARIETY OF FISH SPECIES AND CONTAIN SUFFICIENT QUANTITIES OF WATER TO SUPPORT INDUSTRIAL USES OF THE WATER WITHOUT NEGATIVELY IMPACTING THE AQUATIC HABITAT. IN ORDER TO INCREASE THE SCOPE OF THIS STUDY AND TO CONTINUE TO EVALUATE THE HABITAT ENHANCEMENT POSSIBILITIES IN THESE MATERIAL

SITES, THE DEPARTMENT HAS DEVELOPED AND SUBMITTED A PROPOSAL TO STANDARD ALASKA PRODUCTION COMPANY AND ARCO ALASKA, INC. (ENCLOSURE 1). A SUMMARY OF WORK CONDUCTED TO DATE AND THE PROPOSED SCOPE OF WORK FOR THE NEXT TWO YEARS ARE INCLUDED. INDUSTRY RESPONSE TO THE PROPOSAL AND THE RESULTS OF WORK CONDUCTED HAVE BEEN EXTREMELY POSITIVE;

(3) EXISTING OIL AND GAS ACTIVITIES ON THE NORTH SLOPE HAVE BEEN EXAMINED TO DETERMINE THE TYPE AND NUMBER OF FACILITIES REQUIRED FOR THE PRODUCTION OF OIL AND GAS IN COMMERCIAL QUANTITIES;

(4) GENERAL MITIGATIVE MEASURES (FOR EXAMPLE, ENVIRONMENTALLY SOUND STANDARDS FOR FACILITY SITING) NECESSARY TO ENSURE ADEQUATE PROTECTION OF KEY FISH AND WILDLIFE HABITATS HAVE BEEN RECOMMENDED TO THE DEPARTMENT OF INTERIOR (DOI); AND

(5) RECOMMENDATIONS HAVE BEEN MADE TO THE DOI TO ENSURE THAT A PROPER LEGAL FRAMEWORK IS IN PLACE FOR A SOUND REGULATORY BASIS FOR IMPLEMENTING AND ENFORCING REQUIRED MITIGATION.

IT ALSO WILL BE NECESSARY TO REFINE AND MODIFY MITIGATIVE MEASURES BASED ON FUTURE RESEARCH AND NEW INFORMATION. FURTHERMORE, IF AREAS WITHIN ANWR ARE LEASED, SITE SPECIFIC MITIGATION WILL BE NEEDED FOR EACH EXPLORATION AND PRODUCTION PLAN. FIELD MONITORING AND COMPLIANCE ALSO WILL BE REQUIRED TO ENSURE, TO THE EXTENT PRACTICABLE, THAT MITIGATIVE MEASURES ARE WORKABLE AND THAT COMPLIANCE IS ACHIEVED DURING FIELD ACTIVITIES.

THE STATE OF ALASKA'S RECOMMENDED STRATEGY FOR MITIGATING ADVERSE IMPACTS OF OIL AND GAS EXPLORATION AND PRODUCTION IN THE 1002 AREA OF THE ANWR IS BASED ON A CLEAR AND DISTINCT SEPARATION OF THE EXPLORATION PHASE FOR OIL AND GAS AND THE PRODUCTION PHASE OF AN OIL OR GAS FIELD OF COMMERCIAL SIZE. OUR RECOMMENDATIONS FOLLOW:

(1) WE HAVE SPECIFICALLY REQUESTED THAT THE DOI PREPARE SEPARATE TERMS AND CONDITIONS FOR THE EXPLORATION AND PRODUCTION PHASES. WE BELIEVE THAT WITH SEASONAL CONSTRAINTS ON EXPLORATION ACTIVITIES (E.G., WINTER DRILLING WITH SOME ALL-SEASON ACTIVITY) MOST OF THE ADVERSE EFFECTS OF OIL AND GAS EXPLORATION CAN BE MITIGATED EFFECTIVELY.

IN CONTRAST, IF OIL AND GAS ARE FOUND IN QUANTITIES SUFFICIENT FOR PRODUCTION, THE POTENTIAL FOR IMPACTS TO FISH AND WILDLIFE AND THEIR HABITATS ARE ORDERS OF MAGNITUDE GREATER. PRODUCTION OF OIL AND GAS WILL THEREFORE REQUIRE A SUBSTANTIAL NUMBER OF ADDITIONAL STEPS TO ENSURE ADEQUATE ENVIRONMENTAL PROTECTION.

(2) OUR STRATEGY FOR ENSURING EFFECTIVE MITIGATION OF ADVERSE IMPACTS TO FISH AND WILDLIFE RESOURCES INVOLVES TWO BASIC CONCEPTS. FIRST, THE ESTABLISHMENT OF A JOINT STATE/FEDERAL PROGRAM COVERING THE FOLLOWING PHASES OF OIL AND GAS EXPLORATION AND PRODUCTION IS REQUIRED:

(a) PROJECT PLANNING INCLUDING NECESSARY FIELD STUDIES;
(b) A TECHNICAL ANALYSIS OF PROPOSED DESIGNS, PLANS, AND PROCEDURES (I.E., DESIGN REVIEW);
(c) PERMITTING;
(d) FIELD MONITORING; AND
(e) COMPLIANCE.

SECONDLY, DEVELOPMENT OF EFFECTIVE ENVIRONMENTAL MITIGATION FOR THE PRODUCTION PHASE OF OIL AND GAS DEVELOPMENT IS NEEDED.

IN ORDER TO WORK EFFECTIVELY WITH THE OIL AND GAS INDUSTRY, A JOINT STATE/FEDERAL INTERDISCIPLINARY TEAM WOULD OVERSEE AND PARTICIPATE IN PROJECT PLANNING, PROJECT DESIGN REVIEW, PERMIT ACTIONS, FIELD MONITORING, AND COMPLIANCE. IN ALL ASPECTS OF THIS PROCESS, IT IS ESSENTIAL THAT STATE AND FEDERAL REGULATORY AGENCIES MAINTAIN THEIR OVERSIGHT RESPONSIBILITY WHILE WORKING COOPERATIVELY AND CLOSELY WITH THOSE PARTIES RESPONSIBLE FOR OIL- AND GAS-RELATED ACTIVITIES. PROGRAMS FOR ENSURING PROTECTION OF FISH AND WILDLIFE RESOURCES AND HABITATS EXIST AND HAVE BEEN USED SUCCESSFULLY IN ALASKA FOR LARGE SCALE DEVELOPMENT PROJECTS SUCH AS THE TRANS-ALASKA PIPELINE SYSTEM AND THE PRECONSTRUCTION PHASE OF THE ALASKA NATURAL GAS TRANSPORTATION SYSTEM.

DEVELOPMENT OF EFFECTIVE MITIGATION METHODS AND PROCEDURES IS A PROCESS THAT WILL CONTINUE AS LONG AS THERE IS OIL AND GAS ACTIVITY. A NUMBER OF GENERAL RECOMMENDATIONS ALREADY HAVE BEEN MADE BY THE STATE OF ALASKA BASED ON ADF&G'S MITIGATION POLICY AND EXPERIENCES WITH NORTH SLOPE OIL AND GAS EXPLORATION AND PRODUCTION IN SUCH AREAS AT NATIONAL PETROLEUM RESERVE-ALASKA AND IN OIL PRODUCING FIELDS SUCH AS PRUDHOE BAY, MILNE POINT, ENDICOTT, KUPARUK, AND LISBURNE.

THE ADF&G HAS BEEN INVOLVED IN GATHERING BIOLOGICAL INFORMATION IN ANWR FOR THE LAST SIX YEARS. OUR GAME BIOLOGISTS HAVE WORKED COOPERATIVELY WITH THE USFWS SINCE 1981 DURING THEIR BASELINE STUDY PROGRAMS. PERSONNEL FROM THE DIVISION OF SUBSISTENCE HAVE CONDUCTED RESEARCH IN THE KAKTOVIK AND ARCTIC VILLAGE AREAS DOCUMENTING RESOURCE USE PATTERNS OF INDIVIDUALS LIVING IN THESE AREAS. THESE

EFFORTS ON THE PART OF ADF&G PERSONNEL CONTINUE TODAY IN THE ANWR 1002 AREA, AND OUR HABITAT BIOLOGISTS HAVE BEEN INVOLVED WITH LARGE SCALE CONSTRUCTION PROJECTS THROUGHOUT THE STATE OF ALASKA INCLUDING THE PRUDHOE AND KUPARUK OIL FIELD COMPLEXES.

THE ADF&G HAS ANALYZED THE INFORMATION ON FISH AND WILDLIFE RESOURCES IN THE ANWR, HAS IDENTIFIED SIGNIFICANT DATA GAPS, AND HAS RECOMMENDED MITIGATIVE MEASURES IN LIGHT OF OUR EXPERIENCES WITH NORTH SLOPE OIL AND GAS PRODUCTION AND OTHER OIL-RELATED DEVELOPMENTS WITHIN THE STATE.

IN THE SPRING OF 1986, THE ADF&G EVALUATED THE AVAILABLE RESOURCE INFORMATION FOR THE 1002 AREA AND IDENTIFIED HABITATS OF SPECIAL CONCERN. SPECIFIC EMPHASIS WAS PLACED ON KEY SPECIES IN THE 1002 AREA SUCH AS CARIBOU, MUSKOXEN, ARCTIC CHAR, SNOW GEESE, AND POLAR BEARS. BASED ON THIS EVALUATION, RECOMMENDATIONS WERE MADE TO THE DOI FOR THE MITIGATION OF POTENTIAL ADVERSE IMPACTS TO FISH AND WILDLIFE RESOURCES, THEIR HABITATS, AND USES OF THESE RESOURCES FOR SUBSISTENCE PURPOSES. NOTABLE AREAS OF CONCERN INCLUDED THE FOLLOWING:

(1) THE "CORE CALVING AREA" OF THE PORCUPINE CARIBOU HERD;

(2) A THREE MILE BUFFER ZONE ALONG THE COAST USED BY VARIOUS SPECIES OF WATERFOWL, CARIBOU, AND POLAR BEARS;

(3) FRESH WATER SPRING AREAS SUPPORTING OVERWINTERING FISH;

(4) THE NEARSHORE MARINE ENVIRONMENT USED BY ANADROMOUS FISH AND WATERFOWL DURING THE SUMMER MONTHS; AND

(5) RIPARIAN HABITATS ALONG MAJOR STREAM SYSTEMS.

MITIGATIVE MEASURES FOR THESE HABITATS WERE RECOMMENDED TO ENSURE THE PROPER PROTECTION OF THE VARIOUS FISH AND WILDLIFE SPECIES THAT USE THESE HABITAT TYPES. UTILIZING THIS INFORMATION, WE RECOMMENDED GENERAL APPROACHES TO EFFECTIVE MITIGATION, AS IT WAS DEEMED PREMATURE TO PROVIDE RECOMMENDATIONS ON A SITE-SPECIFIC BASIS. IN RECOMMENDING THESE MITIGATIVE MEASURES, WE GAVE DUE CONSIDERATION TO THE FACT THAT CERTAIN ACTIVITIES AND FACILITIES ASSOCIATED WITH PRODUCTION WOULD BE NEEDED IN SOME OF THESE IMPORTANT HABITATS. IN THESE PARTICULAR CASES, THE RECOMMENDATIONS MADE WERE BALANCED WITH KNOWN REQUIREMENTS OF OIL AND GAS EXPLORATION AND PRODUCTION. IT ALSO MUST BE RECOGNIZED THAT, WITH COMMERCIAL PRODUCTION THERE WILL BE SUBSTANTIAL CHANGES TO SURFACE RESOURCES, ADVERSE EFFECTS TO FISH AND WILDLIFE, AND THAT SOME OF THESE EFFECTS CANNOT BE MITIGATED.

TO ILLUSTRATE HOW THE PROCESS MIGHT WORK IN THE 1002 AREA OF THE ANWR, WE WILL DISCUSS A HABITAT OF SPECIAL CONCERN - STREAM SYSTEMS AND ASSOCIATED RIPARIAN HABITAT - COUPLED WITH AN EXPLORATION AND PRODUCTION ISSUE - INDUSTRIAL REQUIREMENTS FOR TREMENDOUS QUANTITIES OF GRAVEL AND WATER. THIS IS BUT ONE OF THE ENVIRONMENTAL ISSUES THAT WILL HAVE TO BE ADDRESSED IF PORTIONS OF THE 1002 AREA OF ANWR ARE LEASED - EXAMPLES OF SOME OTHER ISSUES ARE DISCUSSED BRIEFLY IN ENCLOSURE II.

BASED ON RESOURCE INFORMATION CURRENTLY AVAILABLE FOR THE 1002 AREA, THE ADF&G DETERMINED THAT STREAM SYSTEMS AND THEIR ASSOCIATED RIPARIAN HABITATS WERE OF MAJOR IMPORTANCE TO MANY FISH AND WILDLIFE SPECIES. MOOSE ON THE NORTH SLOPE OCCUR ALMOST EXCLUSIVELY IN RIPARIAN HABITATS, POLAR BEAR DENS FREQUENTLY ARE LOCATED IN AREAS OF DRIFTED SNOW SUCH AS RIVER CUT BANKS, MAJOR NORTH/SOUTH MOVEMENT CORRIDORS FOR CARIBOU AND MUSKOXEN OCCUR ALONG RIPARIAN HABITATS, SHOREBIRD AND PASSERINE DENSITIES AND DIVERSITIES ARE HIGHEST IN STREAM SYSTEMS AND ASSOCIATED RIPARIAN HABITATS, AND FISHERIES RESOURCES (E.G., ARCTIC CHAR, ARCTIC GRAYLING, WHITEFISH) ARE DEPENDENT ON THESE SYSTEMS. BASED ON THESE RESOURCE VALUES WE RECOMMENDED THAT THESE AREAS BE AFFORDED THE NECESSARY DEGREE OF PROTECTION AND THAT ALL OIL AND GAS FACILITIES WHICH CAN BE MOVED BE PLACED OUTSIDE OF A 3/4 MILE BUFFER ADJACENT TO THE MAJOR RIVER SYSTEMS.

CONSTRUCTION OF FACILITIES WITHIN ANWR OR BETWEEN ANWR AND THE TRANS-ALASKA PIPELINE SYSTEM WOULD OCCUR OVER PERMAFROST SOILS. CURRENT CONSTRUCTION TECHNIQUES REQUIRE THAT ALL STRUCTURES BE PLACED ON GRAVEL PADS WITH A NOMINAL THICKNESS OF FIVE FEET TO PROVIDE ADEQUATE INSULATION, THEREBY PREVENTING THAW DEGREDATION OF UNSTABLE SOILS. ROADS CONNECTING ALL MAJOR OIL AND GAS FACILITIES AND CAUSEWAYS IN THE NEARSHORE ENVIRONMENT ALSO REQUIRE SIGNIFICANT VOLUMES OF MINERAL MATERIAL. WATER REQUIREMENTS ASSOCIATED WITH ICE ROAD AND PAD CONSTRUCTION, HYDROTESTING OF PIPELINES, DRILLING, SAFETY, AND DOMESTIC WATER REQUIREMENTS ARE SIGNIFICANT, AND GREATLY EXCEED THE AMOUNT OF FREE WATER AVAILABLE IN THE ANWR 1002 AREA DURING THE WINTER MONTHS. THE VOLUME OF WATER IN RIVER SYSTEMS PEAKS DURING SPRING RUNOFF AND AFTER SUMMER STORMS BUT DIMINISHES TO ZERO DURING THE LONG WINTER MONTHS WITH THE EXCEPTION OF SPRING AREAS FED BY GROUND WATER. ISOLATED DEEP POOLS MAY OCCUR WITHIN SOME OF THE MAJOR RIVER SYSTEMS SUCH AS THE CANNING RIVER. CLEARLY, INADEQUATE WATER RESERVES EXIST TO SUPPORT LARGE SCALE EXPLORATION OR PRODUCTION ACTIVITIES.

AT THE PRESENT TIME IN THE OILFIELD AROUND PRUDHOE BAY, GRAVEL IS OBTAINED FROM LARGE MINE SITES (SURFACE AREA OF 40 TO 100 ACRES WITH A MINING DEPTH OF 35 TO 70 FEET) LOCATED

BOTH WITHIN AND ADJACENT TO STREAM SYSTEMS. DURING THE LAST SEVEN YEARS, GRAVEL REMOVAL DIRECTLY FROM ACTIVE FLOODPLAIN AREAS HAS BEEN DISCOURAGED BY RESOURCE AGENCIES DUE TO A LACK OF FIELD SURVEILLANCE AND COMPLIANCE AND THE NEED TO ESTABLISH WATER RESERVOIRS. NEW GRAVEL SITES HAVE BEEN LOCATED IN WETLAND AREAS ADJACENT TO STREAM SYSTEMS. FOLLOWING COMPLETION OF MINING AT SPECIFIC GRAVEL SITES, THE MINED OUT SITES HAVE BEEN FLOODED WITH WATER DURING THE BREAKUP PERIOD AND HAVE BEEN CONVERTED INTO WATER RESERVOIRS. RECENT WORK BY THE ADF&G AT SEVERAL OF THESE INUNDATED GRAVEL SITES INDICATES THAT WITH PROPER SITE RESTORATION AND CONTROL OF WATER USE, SOME NET BENEFIT TO SELECTED FISH AND WILDLIFE SPECIES MAY BE ATTAINABLE (ENCLOSURE I). REHABILITATION OF SAG SITE C INVOLVED THE CONSTRUCTION OF ABOUT FIVE ACRES OF LITTORAL HABITAT - THIS WORK WAS COMPLETED IN SEPTEMBER OF 1987. DATA WILL BE COLLECTED ON SAG SITE C DURING THE SUMMER OF 1988 TO EVALUATE THE VALUE OF THE LITTORAL HABITAT ADDED TO THE SITE.

THE STATE OF ALASKA RECOGNIZED, AS DID DOI, THAT PIPELINES AND ROADS WOULD HAVE TO CROSS THESE MAJOR STREAMS AND RIPARIAN HABITATS. PERFORMANCE STANDARDS ON CROSS DRAINAGE WERE DEVELOPED AND PROVIDED TO THE DOI. THESE PERFORMANCE STANDARDS WERE BASED ON EXPERIENCE GAINED DURING THE PAST DECADE OF WORK WITH OIL AND GAS ON THE NORTH SLOPE. THEREFORE, WE RECOMMENDED THAT A COMPREHENSIVE PROGRAM BE INITIATED TO FULLY ASSESS GRAVEL AND WATER AVAILABILITY IN THE ANWR 1002 AREA, INCLUDING AVAILABILITY OF GRAVEL IN FLOODPLAIN AND RIPARIAN HABITATS. DECISIONS ON LOCATIONS OF GRAVEL SITES SHOULD NOT BE MADE WITHOUT AN ADEQUATE DATA BASE ON THE GRAVEL RESOURCES AVAILABLE IN THE VARIOUS HABITAT TYPES, THE MATERIAL REQUIREMENTS FOR EACH EXPLORATION OR PRODUCTION SCENARIO, AND THE IMPACTS OF THE VARIOUS MINE SITE ALTERNATIVES ON FISH AND WILDLIFE HABITAT.

IN THE ANWR AREA, HOWEVER, IT APPEARS THAT THE BEST LOCATION FOR AT LEAST SOME GRAVEL SITES MAY INDEED BE IN RIVER SYSTEMS. THIS POSSIBLE SHIFT IN APPROACH IS BASED ON INFORMATION COLLECTED BY THE ADF&G ON THE NORTH SLOPE THAT INDICATES THAT SOME OF THE GRAVEL SITES THAT HAVE BEEN CONVERTED TO WATER RESERVOIRS MAY ALSO PROVIDE USEABLE HABITAT FOR FISH AND OTHER WILDLIFE SPECIES. HOWEVER, TO DEVELOP GRAVEL SITES IN FLOODPLAIN ENVIRONMENTS AND CONVERT THEM TO USABLE WATER RESERVOIRS WHILE STILL PROVIDING SOME LONG TERM BENEFIT TO FISH AND WILDLIFE, WILL REQUIRE A FULL COMMITMENT ON THE PART OF INDUSTRY AND REGULATORY AGENCIES TO RESOLVE THIS ISSUE. ADVANCE PLANNING, APPROPRIATE DATA COLLECTION, AND ASSESSMENT OF THE OPTIMAL GRAVEL SITES IN TERMS OF SITE LOCATION, MINING PLANS, OPERATIONS, AND REHABILITATION WILL BE REQUIRED.

THEREFORE, WE RECOMMENDED TO THE DOI THAT ALTERNATIVE SOURCES OF WATER BE CONSIDERED AND THAT GRAVEL SITES BE LOCATED, DEVELOPED, AND RESTORED IN A MANNER THAT OVERALL IMPACTS TO WATER QUALITY AND FISH AND WILDLIFE RESOURCES ARE MITIGATED. A POSSIBLE APPROACH TO SUCH A RESOLUTION FOLLOWS.

> A JOINT STATE/FEDERAL INTERDISCIPLINARY TEAM WORKING WITH INDUSTRY SHOULD IDENTIFY ALTERNATIVE APPROACHES FOR THE ACQUISITION OF LARGE QUANTITIES OF WATER AND GRAVEL, INCLUDING NEEDED FIELD STUDIES. SUBSURFACE GEOTECHNICAL STUDIES TO CLEARLY IDENTIFY GRAVEL RESOURCES (QUANTITIES, QUALITY, AND LOCATION) IN VARIOUS HABITAT TYPES SHOULD BE REQUIRED PRIOR TO SUBMITTAL OF INDIVIDUAL PERMIT APPLICATIONS. WORK SHOULD BE INITIATED TO DEVELOP DESIGN CRITERIA AND STANDARDS FOR THE DEVELOPMENT OF MINING PLANS INCLUDING RESTORATION OF GRAVEL SITES CONCURRENT WITH MINING OPERATIONS. MINING PLANS SHOULD BE PREPARED TO INCLUDE CONSIDERATION FOR FISH AND WILDLIFE USE FOLLOWING COMPLETION OF MINING. ALL AREAS, INCLUDING STREAM AND ASSOCIATED RIPARIAN SYSTEMS SHOULD BE CONSIDERED WITH THE OBJECTIVE OF PROVIDING GRAVEL, SUBSEQUENT WATER SITES FOR SUPPORT OF INDUSTRIAL ACTIVITIES, AND FISH AND WILDLIFE HABITAT. ASSUMING THESE ACTIONS ARE TAKEN, WE BELIEVE THAT THE ISSUE OF GRAVEL AND WATER AVAILABILITY AND MITIGATION OF EFFECTS TO FISH AND WILDLIFE RESOURCES CAN BE RESOLVED WITHOUT SIGNIFICANT ADVERSE EFFECTS TO FISH AND WILDLIFE IN THE 1002 AREA OF ANWR. WE ALSO BELIEVE THAT THE POTENTIAL EXISTS FOR PROVIDING HABITAT TO SELECTED SPECIES AS WAS DEMONSTRATED IN THE FIVE YEAR GRAVEL STUDY CONDUCTED BY A CONSULTING FIRM FOR THE USFWS.

WE HAVE FOCUSED ON AN OVERALL APPROACH TO MITIGATION OF ADVERSE IMPACTS TO FISH AND WILDLIFE RESOURCES USING WATER AND GRAVEL TO ILLUSTRATE AN EXAMPLE IN WHICH IMPACTS OF OIL AND GAS PRODUCTION COULD BE MITIGATED IF THE PROPER PROCEDURES WERE FOLLOWED. WE KNOW THAT THERE WILL BE TREMENDOUS DEMANDS FOR WATER AND GRAVEL IF EXPLORATION AND PRODUCTION OCCUR, AND WE KNOW THAT GRAVEL AND WATER SOURCES WILL HAVE TO BE DEVELOPED. WE KNOW THAT WATER IS NOT READILY AVAILABLE IN ANWR. WE ALSO KNOW THAT STREAMS AND ASSOCIATED RIPARIAN HABITATS MUST BE AFFORDED A HIGH DEGREE OF PROTECTION. USING THESE KNOWN FACTORS AS WELL AS OUR EXPERIENCES WITH OIL AND GAS DEVELOPMENT ELSEWHERE ON THE NORTH SLOPE, WE HAVE RECOMMENDED A WORKABLE APPROACH TO RESOLUTION OF THIS PROBLEM WHILE AT THE SAME TIME ENSURING AN ACCEPTABLE LEVEL OF PROTECTION FOR FISH AND WILDLIFE RESOURCES.

ENCLOSURE #1

FISHERIES ENHANCEMENT EVALUATION OF FLOODED GRAVEL MINE SITES WITHIN THE NORTH SLOPE OILFIELDS

A Proposal

by

The Alaska Department of Fish and Game
Habitat Division
1300 College Road
Fairbanks, Alaska 99701

February 1988

FISHERIES ENHANCEMENT EVALUATION OF FLOODED GRAVEL MINE SITES WITHIN THE NORTH SLOPE OILFIELDS

INTRODUCTION

Gravel use associated with oil and gas activities on the North Slope of Alaska has resulted in the removal of large quantities of mineral material. In the early 1970's, gravel was removed using both shallow and deep mining techniques, with shallow scraping and removal of materials occurring in the floodplain of the Sagavanirktok River. In the mid-1970's, a policy decision made by the state agencies required that all new gravel sites be located outside of active floodplains of major rivers. Therefore, almost all gravel sites authorized by the state subsequent to the mid-1970's involved the design and mining of large (average size 17 hectares) sites in which the amount of areal disturbance was minimized and gravels were removed to depths of 15 to 25 meters (m) below existing terrain features. As specific sites were depleted of gravel resources, they were flooded with water from adjacent stream systems.

At this time, there are 11 gravel sites with a surface area of 97.5 hectares which have been flooded. Six of the flooded sites are located within the floodplain of the Kuparuk River, one is in the Sagavanirktok River floodplain, and four are located adjacent to tundra streams in the Kuparuk Development Area. Eight additional gravel sites with a surface area of about 225 hectares have not been flooded.

The establishment of these "artificial" lakes has not only provided an ample supply of surface water for various industrial and domestic uses but also has created a unique aquatic habitat that may have significant potential to support local freshwater and anadromous fish. Nearly all the natural lakes that exist on the coastal plain of the North Slope between the Colville and Canning rivers are relatively shallow with water depths generally less than 2 m. Although these tundra-pond habitats are abundant, such waterbodies generally are too shallow to support overwintering fish. Ice accumulation of up to 2 m typically causes these shallow ponds and lakes to either freeze solid or become anoxic (low dissolved oxygen) during the long ice covered season. Many of the small coastal tundra streams that are devoid of springs, lack deep water habitat, and are not tributary to major river systems also are either devoid of fish or have minimal numbers of fish (Craig 1987, Moulton 1980).

Previous investigations on the availability and suitability of overwintering habitat on the North Slope strongly suggest that a limiting factor on numbers of fish in various types of North Slope waterbodies could be the scarcity of naturally occurring fish overwintering sites. Craig and Poulin (1975) identified only two overwintering areas in the Shaviovik/Kavik River drainage, both of these were associated with perennial springs. Preferred overwintering habitat of arctic cisco (brackish water) was found to be limiting in the lower Sagavanirktok River during the winter of 1985/86 with documented fish mortality occurring in one overwintering pool (Envirosphere 1987, Schmidt et al. 1987). Moulton (1980) conducted open water surveys on the Ugnuravik River, Kalubik Creek, Central Creek, and the Miluveach River and concluded that each river is relatively small with limited overwintering habitat. Results of these studies indicate that a minimal amount of overwintering habitat is present in the lower portion of the Sagavanirktok River, the Shaviovik/Kavik River, and most, if not all, of the small tundra streams on the North Slope.

Flooded gravel mine sites on the North Slope are deeper and larger than many of the known overwintering sites for anadromous and resident fish. Data collected by the Alaska Department of Fish and Game and ARCO, Alaska Inc. in 1986 and 1987 have demonstrated that these sites are much deeper (average depths of roughly 15 meters) than adjacent natural waterbodies and that favorable dissolved oxygen levels exist throughout the winter season in these gravel pits (Hemming 1987a, Garlasco 1987). Phytoplankton standing crops have been assessed (Weber 1988) and fish have been documented in all sites sampled (Hemming 1986, 1987b, 1987c). Evidence has been gathered that phytoplankton standing crops are comparable with natural waterbodies, and plankton tows indicate fair concentrations of copepods and cladocerans. Fish condition has been subjectively determined as excellent and the majority of fish stomachs (e.g., broad whitefish and arctic grayling) sampled have contained food items. All data gathered to date indicate that both rearing and overwintering habitat for fish are present in these partially rehabilitated mine sites. Five sites have been sampled and all have been colonized with two or more fish species. Fish abundance and species diversity are highest in those sites adjacent to large river systems such as Sag Site C in the floodplain of the Sagavanirktok River. It appears that with proper site rehabilitation, enhancement of these large waterbodies could significantly increase the fish carrying capacity of the local waters with direct beneficial effects on local fish populations.

APPLICABILITY

An enhanced understanding of the current use of flooded gravel mine sites by local fish populations can be used to accurately predict what species are likely to colonize sites that will be flooded. If the existing amount of naturally occurring overwintering habitat can be significantly expanded through enhancement of gravel mine sites that are connected to river or stream systems, such sites could provide significant sustained benefits to local fish populations. These sites also may provide for increased rearing and spawning habitat for selected fish species. The best tool in the assessment of future gravel mine sites is the collection of detailed physical, chemical, and biological information on existing sites.

Information gathered from a study of flooded mine sites could be used in the design and siting of new gravel-extraction sites for future oil and gas developments to maximize benefits to local fish populations while simultaneously meeting industrial gravel and water requirements. Equally important, development of such mutually beneficial approaches could be applied to environmentally and politically sensitive new oil and gas frontier areas such as the Arctic National Wildlife Refuge (ANWR).

OBJECTIVES

The proposed fisheries-enhancement evaluation is intended to advance both industry's and the resource agencies' general and specific knowledge relative to the development and implementation of rehabilitation measures at all flooded gravel mine sites on the North Slope. The study is intended to represent a cooperative effort between the ADF&G and the oil and gas industry under the basic assumption that overall direction of this long-term study will be the responsibility of the ADF&G.

Consideration also will be given to the implementation of mitigative measures which would also have a net benefit to selected wildlife species (e.g., waterfowl, shorebirds). It is our intent to solicit the technical input of the U.S. Fish and Wildlife Service in investigating this aspect of the gravel sites.

The intent of these studies will be to develop and implement rehabilitation measures specific to each individual gravel site on the North Slope and to evaluate the effectiveness of these measures. Study results will be used to help determine the siting, design, development, and restoration

of future gravel sites on the North Slope. An assessment of the applicability of these results to other locations within the state also will be a part of this program.

Specific long-term objectives of this study include but are not limited to the following: (Note: It is not our intent to complete work on each objective each year. For example, implementation of a rehabilitation plan for a specific site may take two years of time before actual work is completed in the field.)

(1) To develop, implement, and evaluate site-specific rehabilitation plans for each enhancement site with emphasis on increasing the overall productivity of each waterbody;

(2) To characterize and evaluate the fish species utilizing each enhancement site with emphasis on fish species selectivity for certain site physical and/or chemical characteristics;

(3) To characterize and evaluate the physical characteristics of each potential enhancement site with emphasis on basin morphology;

(4) To characterize and evaluate the chemical characteristics of each potential enhancement site throughout the year with emphasis on those characteristics important to the various life-history stages of specific fish species;

(5) To characterize and evaluate the diversity and abundance of the planktonic communities at each potential enhancement site;

(6) To qualitatively assess benthic communities; and

(7) To investigate and implement, if appropriate, a fish transplant or stocking program where conditions are suitable, but natural dispersal mechanisms of resident and anadromous fish limit colonization of the site.

BACKGROUND AND RELATED RESEARCH

In the summer of 1986, ADF&G Habitat Division initiated a data-acquisition program at three flooded gravel mine sites in the Prudhoe Bay and Kuparuk oilfields (Sag Site C, Kuparuk Mine Sites B and D). Two of these sites are located immediately adjacent to small tundra systems with which they have been connected via natural flooding or by construction of a diversion channel. Fisheries information collected to

date indicates that these sites currently support one or more of the following species of fish: aarctic grayling, arctic char, broad whitefish, round whitefish, arctic cisco and ninespine stickleback. Physical and chemical data indicate that suitable overwintering habitat is available at all three sites (Hemming 1987a, Garlasco 1987).

A significant body of information has been gathered over the past 10 years on the presence and distribution of anadromous fish in the nearshore marine environment. While these studies were primarily focused on impact assessments of oil development (causeways) in the nearshore marine environment, they have nonetheless significantly enhanced the current understanding of the biology of anadromous fish in the Beaufort Sea. One of the hypotheses raised by these investigations is that limited availability of naturally occurring fish-overwintering sites within the Arctic Coastal Plain may be a critical factor in regulating (limiting) population levels for arctic anadromous fish and possibly arctic grayling (Craig 1987).

A cooperative research program on lake and stream ecology in the Toolik Lake area and on the North Slope has been coordinated by the University of Alaska Fairbanks. Several of their specific studies on nutrient cycling and productivity of tundra stream and lake habitats have applicability to the potential enhancement of flooded gravel mine sites (Petersen et al. 1985). Other limnological research on tundra ponds has occurred in the Barrow area and at Peters and Schrader Lakes on the North Slope (Hobbie 1973).

Water quality and fisheries data have been collected by the ADF&G on several of the mine sites in the Prudhoe Bay and Kuparuk Development Areas (Hemming 1986, 1987b, and 1987c). Fisheries surveys on lakes and streams on the North Slope have been conducted by the ADF&G Sport Fish Division since the early 1970's (Roguski and Komarek 1971; Roguski and Winslow 1970; Kogl 1971; Bendock 1977 and 1980; Bendock and Burr 1984, 1985, and 1986). Data on species present, age, growth, and sexual condition of several species of freshwater and anadromous fish has been gathered. Most of the information currently available regarding fish use and the physical characteristics of North Slope riverine overwintering habitat is available in these reports. A number of these studies have involved fisheries and water quality surveys on lakes (e.g., Colville River delta).

METHODS

Fish populations in selected gravel mine sites will be characterized by sampling with multiple-test gear types (fyke nets, experimental gill nets, minnow traps, and beach seines) as site conditions permit. Length, weight, sex, reproductive condition, and stomach-content data will be obtained on subsamples of captured fish.

A population estimate will be developed for arctic grayling in Sag Site C using mark/recapture methods with fyke or hoop traps and gill nets for recapture. Population estimates also may be made on other pits as rehabilitation is implemented. For example, recent construction of shallow water habitat at Sag Site C enables use of fyke or hoop traps to sample fish.

Physical and chemical parameters will be monitored during the open water and ice covered seasons to assess changes in environmental conditions at each of the selected sites. Physical parameters to be measured include water flow through the site, water depth profiles, and surface-acreage estimates. Water samples will be collected with emphasis on dissolved oxygen, salinity, and temperature with respect to water depth and time of year. Chlorophyll A sampling will be conducted to assess phytoplankton standing crop with sampling done during late winter (i.e., immediately prior to breakup) and summer. Primary production estimates will be made for a selected number of sites using light and dark bottles.

PROPOSED SCHEDULE AND WORK PLAN

State Fiscal Year '88: July 1, 1987 to June 30, 1988

- Fish and zooplankton sampling and depth-profile measurements in Mine Sites B and D in Kuparuk, Sag Site C in the Sagavanirktok River, and at the Kuparuk River Deadarm Gravel Sites.
- Water quality sampling in Mine Sites B and D in Kuparuk, Sag Site C in the Sagavanirktok River, and at the Kuparuk Deadarm Gravel Sites (summer and winter sampling for temperature and dissolved oxygen).
- Water quality sampling for heavy metals in Mine Sites B and D in Kuparuk and Sag Site C in the Sagavanirktok River.
- Limited phytoplankton sampling in Mine Sites B and D and Sag Site C in Sagavanirktok River as measured by chlorophyll A.

State Fiscal Year '89: July 1, 1988 to June 30, 1989

- Continue fish and water quality sampling in Mine Sites B and D in Kuparuk, Sag Site C in the Sagavanirktok River, and at the Kuparuk River Deadarm Gravel Sites.
- Expand fish and water quality sampling of pits and add sample stations in the Kuparuk Mine Site C and Putuligayuk (Put) River sites.
- Initiate and complete a population estimate for Arctic grayling in Sag Site C in the Sagavanirktok River.
- Develop and implement an aquatic sampling program to evaluate the effects of adding approximately five acres of littoral habitat to Sag Site C.
- Investigate the Kuparuk River system and/or the Sagavanirktok River system for potential fish capture sites to provide fish for possible transplant into selected gravel sites.
- Investigate the possibility of a fish transplant into one rehabilitated mine site (potential candidate: Kuparuk Mine Sites B and D).

State Fiscal Years '90, '91 and Beyond

Field programs to be determined based on results of field investigations conducted during 1986, 1987, 1988, and 1989. The intent is to maintain flexibility in the program in order to respond to changes in industrial needs for gravel and the results of field investigations. For example, if the Niakuk project proceeds and a suitable gravel site was located in the Sagavanirktok River floodplain, some of the field effort would be redirected to gather data specific to the Niakuk gravel project.

PRODUCTS

Field trip reports and summaries of pertinent data will be completed and submitted after each field trip. An annual report also will be prepared which summarizes work conducted on pits. These reports will be used to formulate proposed scopes of work and budgets for upcoming years.

BUDGET

Fiscal Year '89

LINE 100 (salaries)	$40,000
LINE 200 (travel)	4,000
LINE 300 (other supplies, charges)	2,000
LINE 400 (supplies)	0
LINE 500 (equipment)	3,300

TOTAL BUDGET REQUEST ----------$49,300

State personnel with general fund monies and special project monies also will be assigned to this project; therefore, the total commitment of the department to this project for FY'89 would be in the neighborhood of $80,000.

[1]Equipment List and Cost

YSI D.O./Temp Meter with 100' cable----------	$1,300
Van Dorn Type Sample Bottle----------	600
Digital Titrator, Glass Ware and Reagents for D.O.----------	300
Six 125' Experimental Gill Nets----------	1,100

PERSONNEL

Overall project direction will be provided by Dr. Al Ott of the Habitat Division. Principal responsibility for ensuring that the field work and report preparation are completed in a professional and timely manner will be assumed by the Arctic Area Habitat Biologist, Mr. Carl Hemming. Technical and field assistance to Mr. Hemming will be provided by the following Fish and Game personnel: Dr. Phyllis Weber (fisheries biologist), Mr. Roger Post (wildlife biologist), and Mr. Al Townsend (fisheries biologist).

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ENCLOSURE #2

SUMMARY OF SOME ENVIRONMENTAL ISSUES IN THE 1002 ANWR AREA

(1) FISH PASSAGE AND CROSS-DRAINAGE

CONSTRUCTION OF ROADS AND PIPELINES TO SUPPORT PRODUCTION OF OIL AND GAS WILL INVOLVE A NUMBER OF MAJOR AND MINOR STREAM CROSSINGS. PROVISIONS FOR ADEQUATE CROSS DRAINAGE, FISH PASSAGE, AND MAINTENANCE OF UPSTREAM AND DOWNSTREAM HABITAT TYPES IS ESSENTIAL. DEVELOPMENT OF ENVIRONMENTALLY SOUND DESIGN STANDARDS AND CRITERIA FOR CROSS DRAINAGE STRUCTURES WILL REQUIRE FIELD STUDIES IN ANWR AND AN EVALUATION OF STRUCTURES CURRENTLY IN PLACE IN THE PRUDHOE BAY AND KUPARUK DEVELOPMENT AREAS.

(2) CARIBOU

CONSTRUCTION OF ROADS AND PIPELINES AS PART OF THE PRODUCTION PHASE OF OIL AND GAS DEVELOPMENT HAVE THE POTENTIAL FOR ALTERING THE MOVEMENTS OF CARIBOU. PROVISIONS FOR PROVIDING FREE PASSAGE OF CARIBOU HAVE BEEN USED IN CURRENT OIL AND GAS PIPELINES AND ROADS ON THE NORTH SLOPE. CONSISTENT STANDARDS FOR THE DESIGN OF CARIBOU RAMPS AND AGREEMENT ON A NUMBER OF MITIGATIVE OPTIONS (E.G., SEPARATION OF ROADS AND PIPELINES, BURIED PIPELINE, SEASONAL RESTRAINTS ON THE LEVEL OF ACTIVITY) MUST BE ACHIEVED. DEVELOPMENT OF THESE STANDARDS THROUGH A JOINT STATE/FEDERAL REVIEW PROCESS THAT INVOLVES THE OIL AND GAS INDUSTRY IS ESSENTIAL.

(3) FACILITY SITING

SITING OF FACILITIES IN AN ENVIRONMENTALLY SOUND MANNER WILL REQUIRE THE ACQUISITION OF DETAILED INFORMATION REGARDING THE HABITATS PRESENT AND THEIR RELATIVE VALUE TO THE VARIOUS FISH AND WILDLIFE SPECIES IN THE 1002 AREA OF ANWR. MAPPING OF THESE HABITAT TYPES IN SUCH A MANNER THAT FACILITY SITING DECISIONS CAN BE MADE IS ESSENTIAL. HABITAT TYPING WORK WAS DONE FOR THE PRECONSTRUCTION PHASE OF THE NORTHWEST ALASKAN PIPELINE PROJECT AND PRODUCTS OF THIS EFFORT WERE USED AS A BASIS FOR FACILITY SITING DECISIONS AND REGULATORY PERMIT ACTIONS.

(4) RESTORATION AND REVEGETATION OF DISTURBED AREAS

SEVERAL STUDIES OF VARYING SCOPES HAVE BEEN CONDUCTED ON THE NORTH SLOPE DEALING WITH THE RESTORATION AND REVEGETATION OF DISTURBED AREAS. HOWEVER, WITH THE EXCEPTION OF REHABILITATION IN THE NATIONAL PETROLEUM RESERVE-ALASKA, LITTLE IF ANY REHABILITATION HAS BEEN DONE ON THE NORTH SLOPE. CLEARLY, ADDITIONAL LONG-TERM FIELD STUDIES ARE NEEDED TO PROVIDE THE DATA NECESSARY FOR THE DEVELOPMENT OF DESIGN STANDARDS AND CRITERIA FOR THE REMOVAL OF FACILITIES AND THE REHABILITATION OF DISTURBED AREAS (E.G., GRAVEL PADS, ROADS, MATERIAL SITES). ABANDONED EXPLORATION PADS AND MINED OUT GRAVEL SITES IN THE KUPARUK AND PRUDHOE BAY OILFIELDS COULD SERVE AS STUDY SITES TO PROVIDE SOME OF THE NEEDED INFORMATION.

(5) CAUSEWAYS

SOLID FILLED CAUSEWAYS, INCLUDING STRUCTURES WITH MINIMAL BREACHING, INTERFERE WITH THE FREE MOVEMENT OF FISH AND ALTER THE WATER QUALITY CHARACTERISTIC OF THE NEARSHORE BEAUFORT SEA ENVIRONMENT. THESE NEARSHORE HABITAT CHARACTERISTICS ARE IMPORTANT TO A NUMBER OF ANADROMOUS FISH SPECIES AND OTHER WILDLIFE (E.G., WATERFOWL). THE DESIGN, LOCATION, AND CONSTRUCTION OF MARINE FACILITIES IN THE 1002 AREA WILL HAVE CONSEQUENCES OF MARINE AND FRESHWATER FISH THAT ARE NOT LIMITED TO THE 1002 AREA. MANY OF THESE MARINE AND FRESHWATER ANADROMOUS FISH SPECIES UTILIZE THE BEAUFORT SEA ENVIRONMENT OVER A WIDE GEOGRAPHIC AREA (E.G., ARCTIC CISCO ARE BELIEVED TO MIGRATE FROM THE MACKENZIE RIVER DELTA TO THE COLVILLE RIVER DELTA WHERE THEY REAR UNTIL REACHING MATURITY). THE ISSUE OF CAUSEWAYS AND THE IMPACTS OF THESE STRUCTURES ON THE NEARSHORE ENVIRONMENT AND THOSE SPECIES UTILIZING THESE HABITATS HAS BEEN AND CONTINUES TO BE DEBATED. AFTER NEARLY 10 YEARS OF STUDY SUPPORTED BY INDUSTRY AND AN EXPENDITURE WELL IN EXCESS OF 20 MILLION DOLLARS RESOLUTION HAS NOT BEEN ACHIEVED.

(6) SUBSISTENCE USE PATTERNS

FIELD STUDIES SHOULD BE CONDUCTED TO DETERMINE THE PATTERNS OF HUMAN USE FOR RESIDENTS OF KAKTOVIK AND ARCTIC VILLAGE. CURRENT OIL AND GAS DEVELOPMENT IN THE PRUDHOE BAY AND ADJACENT LANDS HAS NOT HAD THE DIRECT IMPACT TO SUBSISTENCE USE THAT OIL AND GAS DEVELOPMENT IN THE 1002 AREA OF ANWR MIGHT HAVE ON KAKTOVIK AND ARCTIC VILLAGES. SOME WORK HAS ALREADY BEEN DONE IN KAKTOVIK AND ARCTIC VILLAGE; HOWEVER, IT WILL BE

NECESSARY TO ENSURE THAT AN ADEQUATE DATA BASE IS AVAILABLE REGARDING USES OF VARIOUS FISH AND WILDLIFE RESOURCES BY RESIDENTS OF THESE AREAS. THIS INFORMATION WILL BE CRITICAL TO THE DEVELOPMENT AND IMPLEMENTATION OF MITIGATIVE MEASURES AND THE ASSESSMENT OF ADVERSE IMPACTS SHOULD THEY OCCUR.

Attachment 2

TESTIMONY OF DR. ALVIN G. OTT
BEFORE THE SENATE COMMITTEE
ON ENERGY AND NATURAL RESOURCES
October 13, 1987

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

MY NAME IS DR. ALVIN G. OTT. I AM THE REGIONAL SUPERVISOR OF THE HABITAT DIVISION WITH THE ALASKA DEPARTMENT OF FISH AND GAME IN FAIRBANKS, ALASKA.

THE TESTIMONY PRESENTED TODAY FOCUSES ON OIL AND GAS EXPLORATION AND PRODUCTION IN THE 1002 AREA OF THE ARCTIC NATIONAL WILDLIFE REFUGE (ANWR), AND SPECIFICALLY HOW ENVIRONMENTAL IMPACTS FROM LARGE SCALE DEVELOPMENT PROJECTS CAN BE MITIGATED BASED ON EXPERIENCES WITH OIL AND GAS PRODUCTION ON THE NORTH SLOPE OF ALASKA. THE STATE OF ALASKA HAS CONSIDERABLE EXPERTISE, PARTICULARLY THE ALASKA DEPARTMENT OF FISH AND GAME (ADF&G), IN TERMS OF POTENTIAL IMPACTS TO FISH AND WILDLIFE RESOURCES AND ACCEPTABLE MITIGATION WITH RESPECT TO OIL AND GAS EXPLORATION AND PRODUCTION.

IT IS IMPORTANT TO RECOGNIZE THE SCOPE AND MAGNITUDE OF OIL PRODUCTION, AS CONTRASTED WITH EXPLORATION. THE STATE OF ALASKA'S COMMENTS ARE BASED ON THE ASSUMPTION THAT IF AN AREA IS LEASED, PRODUCTION OF OIL AND GAS MAY OCCUR. ENCLOSURE #1 OF THIS TESTIMONY DEPICTS OIL PRODUCING FACILITIES IN PLACE IN 1973 AND 1985 IN THE PRUDHOE BAY AND ADJACENT AREAS. AS CAN BE CLEARLY SEEN BY THE SIGNIFICANT INCREASE IN NUMBER OF FACILITIES BETWEEN 1973 AND 1985, OIL

PRODUCTION IS AN ONGOING ACTIVITY WITH FACILITIES BEING ADDED CONTINUALLY. FOR EXAMPLE, ARCO ALASKA, INC. RECENTLY SUBMITTED PRELIMINARY APPLICATIONS FOR ANOTHER SEVENTEEN DRILL PADS IN THE KUPARUK DEVELOPMENT AREA.

IN ORDER TO EFFECTIVELY MITIGATE POTENTIAL ADVERSE ENVIRONMENTAL EFFECTS OF OIL AND GAS ACTIVITIES, WE HAVE TAKEN THE FOLLOWING STEPS:

(1) A SIGNIFICANT AMOUNT OF INFORMATION HAS BEEN GATHERED BY THE U.S. FISH AND WILDLIFE SERVICE (USFWS) AND THE ADF&G OVER THE PAST FIVE YEARS ON THE DISTRIBUTION AND ABUNDANCE OF FISH AND WILDLIFE RESOURCES IN THE ANWR. THESE DATA HAVE BEEN REVIEWED AND ANALYZED IN ORDER TO IDENTIFY HABITATS OF SPECIAL CONCERN TO SELECTED SPECIES OF FISH AND WILDLIFE;

(2) DATA GAPS HAVE BEEN IDENTIFIED AND STUDIES RECOMMENDED TO FILL THESE DATA GAPS;

(3) EXISTING OIL AND GAS ACTIVITIES ON THE NORTH SLOPE HAVE BEEN EXAMINED TO DETERMINE THE TYPE AND NUMBER OF FACILITIES REQUIRED FOR THE PRODUCTION OF OIL AND GAS IN COMMERCIAL QUANTITIES AND THE IMPACTS OF THESE FACILITIES ON FISH AND WILDLIFE HABITATS;

(4) GENERAL MITIGATIVE MEASURES (FOR EXAMPLE, ENVIRONMENTALLY SOUND STANDARDS FOR FACILITY SITING) THAT WE HAVE FOUND NECESSARY TO ENSURE ADEQUATE PROTECTION OF KEY FISH AND WILDLIFE HABITATS HAVE BEEN RECOMMENDED TO THE DEPARTMENT OF THE INTERIOR (DOI); AND

(5) RECOMMENDATIONS HAVE BEEN MADE TO THE DOI TO ENSURE THAT A PROPER LEGAL FRAMEWORK IS IN PLACE FOR A SOUND REGULATORY BASIS FOR THE IMPLEMENTION AND ENFORCEMENT OF REQUIRED MITIGATION.

IT ALSO WILL BE NECESSARY TO REFINE AND MODIFY MITIGATIVE MEASURES BASED ON FUTURE RESEARCH AND NEW INFORMATION.

FURTHERMORE, IF AREAS WITHIN ANWR ARE LEASED, SITE SPECIFIC MITIGATION WILL BE NEEDED FOR EACH EXPLORATION AND PRODUCTION PLAN. FIELD MONITORING AND COMPLIANCE ALSO WILL BE REQUIRED TO ENSURE, TO THE EXTENT PRACTICABLE, THAT MITIGATIVE MEASURES ARE WORKABLE AND THAT COMPLIANCE IS ACHIEVED DURING FIELD ACTIVITIES.

THE STATE OF ALASKA'S RECOMMENDED STRATEGY FOR MITIGATING ADVERSE IMPACTS OF OIL AND GAS EXPLORATION AND PRODUCTION IN THE 1002 AREA OF THE ANWR IS BASED ON A CLEAR AND DISTINCT SEPARATION OF THE EXPLORATION PHASE FOR OIL AND GAS AND THE PRODUCTION PHASE OF AN OIL OR GAS FIELD OF COMMERCIAL SIZE. OUR RECOMMENDATIONS FOLLOW:

(1) WE HAVE REQUESTED THAT THE DOI PREPARE SEPARATE TERMS AND CONDITIONS FOR THE EXPLORATION AND PRODUCTION PHASES. WE BELIEVE THAT WITH SEASONAL CONSTRAINTS ON EXPLORATION ACTIVITIES (E.G., WINTER DRILLING WITH SOME ALL-SEASON ACTIVITY) MOST OF THE POTENTIAL ADVERSE EFFECTS OF OIL AND GAS EXPLORATION CAN BE MITIGATED EFFECTIVELY.

IN CONTRAST, IF OIL AND GAS ARE FOUND IN QUANTITIES SUFFICIENT FOR PRODUCTION, THE POTENTIAL FOR IMPACTS TO FISH AND WILDLIFE AND THEIR HABITATS ARE ORDERS OF MAGNITUDE GREATER. PRODUCTION OF OIL AND GAS WILL THEREFORE REQUIRE A SUBSTANTIAL NUMBER OF ADDITIONAL STEPS TO ENSURE ADEQUATE ENVIRONMENTAL PROTECTION.

(2) OUR STRATEGY FOR ENSURING EFFECTIVE MITIGATION OF ADVERSE IMPACTS TO FISH AND WILDLIFE RESOURCES INVOLVES TWO BASIC CONCEPTS. FIRST, THE ESTABLISHMENT OF A JOINT STATE/FEDERAL PROGRAM COVERING THE FOLLOWING PHASES OF OIL AND GAS EXPLORATION AND PRODUCTION IS REQUIRED:

(a) PROJECT PLANNING INCLUDING NECESSARY FIELD STUDIES;
(b) A TECHNICAL ANALYSIS OF PROPOSED DESIGNS, PLANS, AND PROCEDURES (I.E., DESIGN REVIEW);
(c) PERMITTING;
(d) FIELD MONITORING; AND
(e) COMPLIANCE.

SECOND, DEVELOPMENT OF EFFECTIVE ENVIRONMENTAL MITIGATION FOR THE PRODUCTION PHASE OF OIL AND GAS DEVELOPMENT IS NEEDED.

IN ORDER TO WORK EFFECTIVELY WITH THE OIL AND GAS INDUSTRY, A JOINT STATE/FEDERAL INTERDISCIPLINARY TEAM WOULD OVERSEE AND PARTICIPATE IN PROJECT PLANNING, PROJECT DESIGN REVIEW, PERMIT ACTIONS, FIELD MONITORING, AND COMPLIANCE. IN ALL ASPECTS OF THIS PROCESS, IT IS ESSENTIAL THAT STATE AND FEDERAL REGULATORY ACENCIES MAINTAIN THEIR OVERSIGHT RESPONSIBILITY WHILE WORKING COOPERATIVELY AND CLOSELY WITH THOSE PARTIES RESPONSIBLE FOR OIL- AND GAS-RELATED ACTIVITIES. AS RESEARCH RESULTS BECOME AVAILABLE IN THE FUTURE, THIS GROUP WOULD INCORPORATE APPROPRIATE CONCLUSIONS IN PROJECT PLANNING AND APPROVALS. PROGRAMS FOR ENSURING PROTECTION OF FISH AND WILDLIFE RESOURCES AND HABITATS EXIST AND HAVE BEEN USED SUCCESSFULLY IN ALASKA FOR LARGE SCALE DEVELOPMENT PROJECTS SUCH AS THE TRANS-ALASKA PIPELINE SYSTEM AND THE PRECONSTRUCTION PHASE OF THE ALASKA NATURAL GAS TRANSPORTATION SYSTEM.

DEVELOPMENT OF EFFECTIVE MITIGATION METHODS AND PROCEDURES IS A PROCESS THAT WILL CONTINUE AS LONG AS THERE IS OIL AND GAS ACTIVITY. A NUMBER OF GENERAL RECOMMENDATIONS ALREADY HAVE BEEN MADE BY THE STATE OF ALASKA BASED ON ADF&G'S MITIGATION POLICY AND EXPERIENCES WITH NORTH SLOPE OIL AND GAS EXPLORATION AND PRODUCTION IN SUCH AREAS AS THE NATIONAL PETROLEUM

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RESERVE-ALASKA AND IN OIL PRODUCING FIELDS SUCH AS PRUDHOE BAY, MILNE POINT, ENDICOTT, KUPARUK, AND LISBURNE.

THE ADF&G HAS BEEN INVOLVED IN GATHERING BIOLOGICAL INFORMATION IN ANWR FOR THE LAST SIX YEARS. OUR GAME BIOLOGISTS HAVE WORKED COOPERATIVELY WITH THE USFWS SINCE 1981 ON BASELINE BIOLOGICAL STUDIES. PERSONNEL FROM THE DIVISION OF SUBSISTENCE HAVE CONDUCTED RESEARCH IN THE KAKTOVIK AND ARCTIC VILLAGE AREAS DOCUMENTING RESOURCE USE PATTERNS OF INDIVIDUALS LIVING IN THESE AREAS. THESE EFFORTS ON THE PART OF ADF&G PERSONNEL CONTINUE TODAY IN THE ANWR 1002 AREA, AND OUR HABITAT BIOLOGISTS HAVE BEEN INVOLVED WITH LARGE SCALE CONSTRUCTION PROJECTS THROUGHOUT ALASKA INCLUDING THE PRUDHOE AND KUPARUK OIL FIELD COMPLEXES. WE HAVE ANALYZED THE INFORMATION ON FISH AND WILDLIFE RESOURCES IN THE ANWR, IDENTIFIED SIGNIFICANT DATA GAPS, AND RECOMMENDED MITIGATIVE MEASURES IN LIGHT OF OUR EXPERIENCES WITH NORTH SLOPE OIL AND GAS PRODUCTION AND OTHER OIL-RELATED DEVELOPMENTS WITHIN THE STATE.

IN THE SPRING OF 1986, THE ADF&G EVALUATED THE AVAILABLE RESOURCE INFORMATION FOR THE 1002 AREA AND IDENTIFIED HABITATS OF SPECIAL CONCERN. SPECIFIC EMPHASIS WAS PLACED ON KEY SPECIES IN THE 1002 AREA SUCH AS CARIBOU, MUSKOXEN, ARCTIC CHAR, SNOW GEESE, AND POLAR BEARS. BASED ON THIS EVALUATION, RECOMMENDATIONS WERE MADE TO THE DOI FOR THE MITIGATION OF POTENTIAL ADVERSE IMPACTS TO FISH AND WILDLIFE RESOURCES, THEIR HABITATS, AND USES OF THESE RESOURCES FOR SUBSISTENCE PURPOSES. NOTABLE AREAS OF CONCERN INCLUDED THE FOLLOWING:

(1) THE "CORE CALVING AREA" OF THE PORCUPINE CARIBOU HERD;

(2) A THREE MILE BUFFER ZONE ALONG THE COAST USED BY VARIOUS SPECIES OF WATERFOWL, CARIBOU, AND POLAR BEARS;

(3) FRESH WATER SPRING AREAS SUPPORTING OVERWINTERING FISH;

(4) THE NEARSHORE MARINE ENVIRONMENT USED BY ANADROMOUS FISH AND WATERFOWL DURING THE SUMMER MONTHS; AND

(5) RIPARIAN HABITATS ALONG MAJOR STREAM SYSTEMS.

MITIGATIVE MEASURES FOR THESE HABITATS WERE RECOMMENDED TO ENSURE THE PROPER PROTECTION OF THE VARIOUS FISH AND WILDLIFE SPECIES THAT USE THESE HABITAT TYPES. UTILIZING THIS INFORMATION, WE RECOMMENDED GENERAL APPROACHES TO EFFECTIVE MITIGATION, AS WE DEEMED IT PREMATURE TO PROVIDE RECOMMENDATIONS ON A SITE-SPECIFIC BASIS. IN RECOMMENDING THESE MITIGATIVE MEASURES, WE GAVE DUE CONSIDERATION TO THE FACT THAT CERTAIN ACTIVITIES AND FACILITIES ASSOCIATED WITH PRODUCTION WOULD BE NEEDED IN SOME OF THESE IMPORTANT HABITATS. IN THESE PARTICULAR CASES, THE RECOMMENDATIONS MADE WERE BALANCED WITH KNOWN REQUIREMENTS OF OIL AND GAS EXPLORATION AND PRODUCTION. ALTHOUGH THESE MEASURES WOULD MITIGATE MANY OF THE EFFECTS OF EXPLORATION AND DEVELOPMENT, IT SHOULD BE NOTED THAT SOME EFFECTS CANNOT BE FULLY MITIGATED.

TO ILLUSTRATE HOW THE PROCESS MIGHT WORK IN THE 1002 AREA OF THE ANWR, WE WILL DISCUSS A HABITAT OF SPECIAL CONCERN - STREAM SYSTEMS AND ASSOCIATED RIPARIAN HABITATS - COUPLED WITH AN EXPLORATION AND PRODUCTION ISSUE - INDUSTRIAL REQUIREMENTS FOR TREMENDOUS QUANTITIES OF GRAVEL AND WATER. THIS IS BUT ONE OF THE ENVIRONMENTAL ISSUES THAT WILL HAVE TO BE ADDRESSED IF PORTIONS OF THE 1002 AREA OF ANWR ARE LEASED - EXAMPLES OF SOME OTHER ISSUES ARE DISCUSSED BRIEFLY IN ENCLOSURE II.

BASED ON RESOURCE INFORMATION CURRENTLY AVAILABLE FOR THE 1002 AREA, THE ADF&G DETERMINED THAT STREAM SYSTEMS AND

THEIR ASSOCIATED RIPARIAN HABITATS WERE OF MAJOR IMPORTANCE TO MANY FISH AND WILDLIFE SPECIES. MOOSE ON THE NORTH SLOPE OCCUR ALMOST EXCLUSIVELY IN RIPARIAN HABITATS, POLAR BEAR DENS FREQUENTLY ARE LOCATED IN AREAS OF DRIFTED SNOW SUCH AS CUTBANKS ALONG LOWER PORTIONS OF THE RIVERS, MAJOR NORTH/SOUTH MOVEMENT CORRIDORS FOR CARIBOU AND MUSKOXEN OCCUR ALONG RIPARIAN HABITATS, SHOREBIRD AND PASSERINE DENSITIES AND DIVERSITIES ARE HIGHEST IN STREAM SYSTEMS AND ASSOCIATED RIPARIAN HABITATS, AND FISHERIES RESOURCES (E.G., ARCTIC CHAR, ARCTIC GRAYLING, WHITEFISH) ARE DEPENDENT ON THESE SYSTEMS. BASED ON THESE RESOURCE VALUES WE RECOMMENDED THAT THESE AREAS BE AFFORDED THE NECESSARY DEGREE OF PROTECTION AND THAT ALL OIL AND GAS FACILITIES WHICH CAN BE MOVED BE PLACED OUTSIDE OF A 3/4 MILE BUFFER ADJACENT TO THE MAJOR RIVER SYSTEMS.

CONSTRUCTION OF FACILITIES WITHIN ANWR OR BETWEEN ANWR AND THE TRANS-ALASKA PIPELINE SYSTEM WOULD OCCUR OVER PERMAFROST SOILS. CURRENT CONSTRUCTION TECHNIQUES REQUIRE THAT ALL STRUCTURES BE PLACED ON GRAVEL PADS WITH A NOMINAL THICKNESS OF FIVE FEET TO PROVIDE ADEQUATE INSULATION, THEREBY PREVENTING THAW DEGREDATION OF UNSTABLE SOILS. ROADS CONNECTING ALL MAJOR OIL AND GAS FACILITIES AND CAUSEWAYS IN THE NEARSHORE ENVIRONMENT ALSO REQUIRE SIGNIFICANT VOLUMES OF MINERAL MATERIAL. WATER REQUIREMENTS ASSOCIATED WITH ICE ROAD AND PAD CONSTRUCTION, HYDROTESTING OF PIPELINES, DRILLING, SAFETY, AND DOMESTIC WATER REQUIREMENTS ARE SIGNIFICANT, AND GREATLY EXCEED THE AMOUNT OF FREE WATER AVAILABLE IN THE ANWR 1002 AREA DURING THE WINTER MONTHS. THE VOLUME OF WATER IN RIVER SYSTEMS PEAKS DURING SPRING RUNOFF AND AFTER SUMMER STORMS BUT DIMINISHES TO ZERO DURING THE LONG WINTER MONTHS WITH THE EXCEPTION OF SPRING AREAS FED BY GROUNDWATER. ISOLATED DEEP POOLS MAY OCCUR WITHIN SOME OF THE MAJOR RIVER SYSTEMS SUCH AS THE CANNING RIVER. INADEQUATE WATER RESERVES EXIST WITHIN ANWR TO SUPPORT LARGE SCALE EXPLORATION OR PRODUCTION ACTIVITIES.

AT THE PRESENT TIME IN THE OILFIELD AROUND PRUDHOE BAY, GRAVEL IS OBTAINED FROM LARGE MINE SITES (SURFACE AREA OF 40 TO 100 ACRES WITH A MINING DEPTH OF 35 TO 70 FEET) LOCATED BOTH WITHIN AND ADJACENT TO STREAM SYSTEMS. DURING THE LAST SEVEN YEARS, GRAVEL REMOVAL DIRECTLY FROM ACTIVE FLOODPLAIN AREAS HAS BEEN DISCOURAGED BY RESOURCE AGENCIES DUE TO A LACK OF FIELD SURVEILLANCE AND COMPLIANCE AND THE NEED TO ESTABLISH WATER RESERVOIRS. NEW GRAVEL SITES HAVE BEEN LOCATED IN WETLAND AREAS ADJACENT TO STREAM SYSTEMS. FOLLOWING COMPLETION OF MINING AT SPECIFIC GRAVEL SITES, THE MINED-OUT SITES HAVE BEEN FLOODED WITH WATER DURING THE BREAKUP PERIOD AND HAVE BEEN CONVERTED INTO WATER RESERVOIRS. RECENT WORK BY THE ADF&G AT SEVERAL OF THESE INUNDATED GRAVEL SITES INDICATES THAT WITH PROPER SITE RESTORATION AND CONTROL OF WATER USE, SOME NET BENEFIT TO SELECTED FISH AND WILDLIFE SPECIES MAY BE ATTAINABLE. TO DATE, HOWEVER, NO MATERIAL SITES IN THE PRUDHOE BAY AREA HAVE BEEN RESTORED IN SUCH A MANNER THAT THEY PROVIDE SUITABLE HABITAT FOR FISH AND WILDLIFE.

THE STATE OF ALASKA RECOGNIZED, AS DID DOI, THAT PIPELINES AND ROADS WOULD HAVE TO CROSS THESE MAJOR STREAMS AND RIPARIAN HABITATS. PERFORMANCE STANDARDS ON CROSS DRAINAGE WERE DEVELOPED AND PROVIDED TO THE DOI. THESE PERFORMANCE STANDARDS WERE BASED ON EXPERIENCE GAINED DURING THE PAST DECADE OF WORK WITH OIL AND GAS ON THE NORTH SLOPE. THEREFORE, WE RECOMMENDED THAT A COMPREHENSIVE PROGRAM BE INITIATED TO FULLY ASSESS GRAVEL AND WATER AVAILABILITY IN THE ANWR 1002 AREA, INCLUDING AVAILABILITY OF GRAVEL IN FLOODPLAIN AND RIPARIAN HABITATS. DECISIONS ON LOCATIONS OF GRAVEL SITES SHOULD NOT BE MADE WITHOUT AN ADEQUATE DATA BASE ON THE GRAVEL RESOURCES AVAILABLE IN THE VARIOUS HABITAT TYPES, THE MATERIAL REQUIREMENTS FOR EACH EXPLORATION OR PRODUCTION SCENARIO, AND THE IMPACTS OF THE VARIOUS MINE SITE ALTERNATIVES ON FISH AND WILDLIFE HABITAT.

IN THE ANWR AREA, HOWEVER, IT APPEARS THAT THE BEST LOCATION FOR AT LEAST SOME GRAVEL SITES MAY INDEED BE IN RIVER SYSTEMS. THIS SHIFT IN APPROACH IS BASED ON INFORMATION COLLECTED BY THE ADF&G ON THE NORTH SLOPE THAT INDICATES THAT SOME OF THE GRAVEL SITES THAT HAVE BEEN CONVERTED TO WATER RESERVOIRS MAY ALSO PROVIDE USABLE HABITAT FOR FISH AND OTHER WILDLIFE SPECIES. HOWEVER, TO DEVELOP GRAVEL SITES IN FLOODPLAIN ENVIRONMENTS AND CONVERT THEM TO USABLE WATER RESERVOIRS WHILE STILL PROVIDING SOME LONG TERM BENEFIT TO FISH AND WILDLIFE, WILL REQUIRE A FULL COMMITMENT ON THE PART OF INDUSTRY AND REGULATORY AGENCIES TO RESOLVE THIS ISSUE. ADVANCE PLANNING, APPROPRIATE DATA COLLECTION, AND ASSESSMENT OF THE OPTIMAL GRAVEL SITES IN TERMS OF SITE LOCATION, MINING PLANS, OPERATIONS, AND REHABILITATION WILL BE REQUIRED.

THEREFORE, WE RECOMMENDED TO THE DOI THAT ALTERNATIVE SOURCES OF WATER BE CONSIDERED, AND THAT GRAVEL SITES BE SITED, DEVELOPED, AND RESTORED IN A MANNER SUCH THAT OVERALL IMPACTS TO WATER QUALITY AND FISH AND WILDLIFE RESOURCES ARE MITIGATED. A POSSIBLE APPROACH TO SUCH A RESOLUTION FOLLOWS.

> A JOINT STATE/FEDERAL INTERDISCIPLINARY TEAM WORKING WITH INDUSTRY SHOULD IDENTIFY ALTERNATIVE APPROACHES FOR THE ACQUISITION OF LARGE QUANTITIES OF WATER AND GRAVEL, INCLUDING NEEDED FIELD STUDIES. SUBSURFACE GEOTECHNICAL STUDIES TO IDENTIFY GRAVEL RESOURCES (QUANTITIES, QUALITY, AND LOCATION) IN VARIOUS HABITAT TYPES SHOULD BE REQUIRED PRIOR TO SUBMITTAL OF INDIVIDUAL PERMIT APPLICATIONS. WORK SHOULD BE INITIATED TO DEVELOP DESIGN CRITERIA AND STANDARDS FOR THE DEVELOPMENT OF MINING PLANS INCLUDING RESTORATION OF GRAVEL SITES CONCURRENT WITH MINING OPERATIONS. MINING PLANS SHOULD BE PREPARED TO INCLUDE CONSIDERATION FOR FISH AND WILDLIFE USE FOLLOWING COMPLETION OF MINING. ALL AREAS, INCLUDING STREAM AND ASSOCIATED RIPARIAN SYSTEMS SHOULD BE CONSIDERED WITH THE OBJECTIVE OF PROVIDING GRAVEL, SUBSEQUENT WATER SITES FOR SUPPORT OF INDUSTRIAL ACTIVITIES, AND FISH AND WILDLIFE HABITAT. ASSUMING THESE ACTIONS ARE TAKEN, WE BELIEVE THAT THE ISSUE OF GRAVEL AND WATER AVAILABILITY AND MITIGATION OF EFFECTS TO FISH AND WILDLIFE RESOURCES CAN BE RESOLVED WITHOUT SIGNIFICANT ADVERSE EFFECTS TO FISH AND WILDLIFE IN THE 1002 AREA OF ANWR. WE ALSO BELIEVE THAT THE POTENTIAL EXISTS FOR PROVIDING HABITAT TO SELECTED SPECIES AS WAS DEMONSTRATED IN THE FIVE YEAR GRAVEL STUDY CONDUCTED BY A CONSULTING FIRM FOR THE USFWS.

WE HAVE FOCUSED ON AN OVERALL APPROACH TO MITIGATION OF ADVERSE IMPACTS TO FISH AND WILDLIFE RESOURCES USING WATER AND GRAVEL TO ILLUSTRATE AN EXAMPLE IN WHICH IMPACTS OF OIL AND GAS PRODUCTION COULD BE MITIGATED IF THE PROPER PROCEDURES WERE FOLLOWED. WE KNOW THAT THERE WILL BE TREMENDOUS DEMANDS FOR WATER AND GRAVEL IF EXPLORATION AND PRODUCTION OCCUR, AND WE KNOW THAT GRAVEL AND WATER SOURCES WILL HAVE TO BE DEVELOPED. WE KNOW THAT WATER IS NOT READILY AVAILABLE IN ANWR. WE ALSO KNOW THAT STREAMS AND ASSOCIATED RIPARIAN HABITATS MUST BE AFFORDED A HIGH DEGREE OF PROTECTION. USING THESE KNOWN FACTORS AS WELL AS OUR EXPERIENCES WITH OIL AND GAS DEVELOPMENT ELSEWHERE ON THE NORTH SLOPE, WE HAVE RECOMMENDED A WORKABLE APPROACH TO RESOLUTION OF THIS PROBLEM WHILE AT THE SAME TIME ENSURING AN ACCEPTABLE LEVEL OF PROTECTION FOR FISH AND WILDLIFE RESOURCES.

UNLIKE THE GRAVEL AND WATER EXAMPLE, WE DO NOT CURRENTLY BELIEVE THAT SUFFICIENT INFORMATION NOR EFFECTIVE MITIGATIVE MEASURES EXIST TO PREVENT ADVERSE IMPACTS TO THE PORCUPINE CARIBOU HERD WITHIN THE CORE CALVING AREA. AT THIS TIME, MR. KEN WHITTEN (ADF&G) WILL DISCUSS THE PORCUPINE CARIBOU HERD WITH EMPHASIS ON CARIBOU CALVING IN THE 1002 AREA.

Attachment 3

**TESTIMONY OF LARRY DIETRICK
BEFORE THE HOUSE SUBCOMMITTEE ON FISHERIES
AND WILDLIFE CONSERVATION
AND THE ENVIRONMENT**

FEBRUARY 24, 1988

Mr. Chairman and Members of the Subcommittee:

My name is Larry Dietrick. I am Director of the Division of Environmental Quality for the Alaska Department of Environmental Conservation.

The Department of Environmental Conservation is the state regulatory agency with primary responsibility for environmental protection. We have programs governing air quality, water pollution control, solid waste management, hazardous waste management, and oil spill prevention and response. We write permits specifying emission levels and disposal methods, monitor activities under permits, review plans, conduct inspections, provide technical assistance and take enforcement actions when needed. The Department has considerable experience with the effects of oil and gas activities and is in a good position to develop effective environmental protection measures for new areas like the Arctic National Wildlife Refuge (ANWR).

On Alaska's North Slope, the Department has developed stipulations for oil and gas lease sales, reviewed siting of facilities, evaluated monitoring data and carried out a wide range of environmental protection activities. We also participate in the design and review of environmental studies, perform field monitoring, conduct sampling and investigations, and maintain a field office at Prudhoe Bay in Deadhorse.

There has been oil and gas exploration and development on the

Arctic Slope for over twenty years. During this period technology and operating practices as well as federal and state regulatory requirements have evolved considerably. This experience sheds light on what works in the arctic environment and where improvement is needed.

The state believes that, with proper management and oversight, exploration and development can be conducted while protecting the special values of ANWR. This will require continuing the improvements in waste management practices that have occurred during the history of petroleum development in the Arctic. Congress will set the level of performance for ANWR. A good foundation already exists for developing effective environmental protection measures that deliver the performance envisioned by Governor Cowper.

Meeting this challenge will require careful use of lease stipulations and permit conditions that build upon what we have learned from other North Slope developments. In addition, field monitoring and, if necessary, enforcement are essential. To bring these elements together, several steps are required.

1. Coordinate efforts among state and federal agencies.

   To achieve the optimum level of environmental protection the state and federal regulatory agencies must coordinate their efforts. The most effective means of ensuring coordination while recognizing the authorities of the respective state and federal agencies is to establish formally an interdisciplinary, interagency process. State and federal agencies would jointly consider comprehensive planning, design review, stipulation development, technology evaluation, research, permitting, surveillance, impact monitoring, compliance and enforcement, and reclamation

and restoration.

If developed properly, this would avoid duplication, eliminate permitting conflicts, and provide a mechanism by which changing regulatory requirements or technology could be incorporated into decisions in a consistent manner. In all aspects of this process, it is essential that state and federal regulatory agencies maintain their separate oversight responsibilities and that industry be involved at appropriate points.

2. Evaluate past practices and identify which activities or practices require additional study and analysis.

The experience gained from oil and gas development at Prudhoe provides a basis for determining what practices would be acceptable and appropriate for new areas like ANWR. Evaluation of past practices is essential to prevent recurrence of past problems or the potential for impacts. These lessons can serve as guidelines for development in the future.

Exploration and development of petroleum resources poses waste management challenges that must be met in order to protect the environment. The department encourages use of practices that minimize or reduce wastes. The best course of action, in most cases, is to minimize or eliminate impacts or the potential for impacts by "designing out" environmental problems and "designing in" environmental safeguards. An example of this would be managing drilling wastes in such a fashion that discharges to the tundra are eliminated via pit closeout, recycling or re-injection. Where wastes require further management, we encourage use of best management practices and state of the art technology.

The department is currently reviewing North Slope waste disposal practices. A technical accounting of these practices, a description of their evolution, and an assessment of potential impacts will help identify the most appropriate management regime for each waste stream for ANWR.

3. Develop specific environmental stipulations and permit conditions including best management practices and state of the art technology.

Environmental stipulations are among the primary tools used to achieve effective environmental protection. Lease stipulations apply to the tracts to be explored and developed and should be tailored to the conditions found there. Permit conditions are written to govern specific activities of the permit applicant, often in a particular location. Effective use of these tools requires flexibility so they may reflect changes in technology, legal requirements or new scientific data.

Similarly, it is appropriate that state of the art technology be applied to selected waste streams to help achieve effective environmental protection. Selection and application of state of the art technology frequently prevents problems from occurring in the field and in most cases takes into account the goals of waste minimization, recycling and reduction. This can significantly reduce the amount of wastes to be disposed.

4. Develop comprehensive environmental plans.

Planning before start-up is essential for proper management of waste streams in ANWR. Inadequate planning before start-up was a major reason why some

North Slope development occurred without the best technology. Similarly, inadequate planning led to the absence of sufficient waste disposal facilities for the oil field support industry, which does not have access to the same disposal facilities as the field operators. This has contributed to the abandonment of drums and dumping of other waste materials on vacant sites in the Deadhorse area.

Careful planning can prevent the majority of field problems and impacts. It is also much less expensive and more effective than corrective actions in the field or other remedial work.

Comprehensive environmental plans should address the ways by which various waste management and disposal practices, including waste reduction, minimization and recycling will be performed. These should cover air emissions, liquid wastewater, solid waste, oily waste, hazardous waste, spills, waste oil, and others. These plans are essential to ensure that the applicant has identified all waste products and provided for their proper management and disposal.

5. Monitor impacts and activities.

Monitoring provides data to evaluate the effectiveness of permit conditions and lease stipulations. It may demonstrate the need to modify environmental requirements or operating methods and may help identify areas where additional study is needed. Monitoring helps determine whether operations are in compliance with these requirements and with other environmental standards. For example, data from water quality monitoring under the new drilling mud disposal regulations will show whether

contamination is occurring. If it is, the regulations require corrective measures.

Effective environmental protection can be achieved only through adequate monitoring.

Chairman Studds requested in his January 26, 1988 letter that I specifically address a number of questions for the subcommittee. Those questions and their responses are included as Attachment 1.

In summary, the department believes that the experience gained from the history of oil and gas development on the North Slope provides a good foundation for opening ANWR to responsible oil and gas development. Governor Cowper has taken a firm position that ANWR exploration and development must be done right, and that the environment and the special values of ANWR must be protected. I have outlined the essential components to achieve the goal of an effective environmental protection strategy for ANWR. Of course, effective environmental protection can be accomplished only with adequate staffing and funding.

A summary of waste stream management and other environmental protection issues relevant to oil and gas development is included as Attachment 2 to this testimony.

The state is currently reviewing ANWR legislative proposals. Our department is participating in that process and our comments on the various provisions of these bills will be included as part of the overall state position.

Mr. Chairman, the Department of Environmental Conservation is available to the members and staff to discuss the details of environmental matters affecting your decision about ANWR. Thank you for the opportunity to testify. We look forward to working with you.

ATTACHMENT 2

SUMMARY OF WASTE STREAM MANAGEMENT AND OTHER ENVIRONMENTAL PROTECTION ISSUES RELEVANT TO OIL AND GAS DEVELOPMENT IN THE ARCTIC NATIONAL WILDLIFE REFUGE

AIR QUALITY

The principal air pollutants discharged during oil and gas development are sulphur dioxide, suspended particulate matter, carbon monoxide, hydrocarbons, and nitrogen oxides. Concentrations of these four types of emissions depend, in large part, on the type, volume and characteristics of fuel burned in the turbines, generators, and other internal combustion engines, the amount of flaring and venting in the area, and fugitive dust from roads and construction activities.

Flaring is a significant contributor to visibility impairment. Flaring during exploratory flow testing, start up and upsets of production facilities, and operational phases is potentially a major source of emissions of soot -- primarily carbon and unburned hydrocarbons -- as well as other materials. Technology exists to prevent such problems in future developments.

The primary source of NOx at Prudhoe Bay is the more than 100 gas turbines, each rated at more than 10,000 horsepower. Approximately 20 air quality permits have been issued, and three are pending. The cumulative annual discharge allowed under these permits is more than 90,000 tons of NOx. Actual emissions are approximately 10 to 30 percent of the permitted values. Modeling has been used to estimate the ground level concentrations of NOx and ground level monitoring is employed to verify the modeling

effort and measure ambient levels.

LIQUID WASTE MANAGEMENT

Liquid waste discharges include domestic wastewater, reserve pit fluids, brine discharges, hydrostatic test discharges, vessel rinsates, radiographic wastes, excavation discharges, oily wastewater streams, equipment washing runoff, workover fluids, waste oil, solvents, and a wide range of other wastewater streams. Each needs to be identified with a provision made for proper disposal.

Zero discharge of non-domestic (industrial) wastewater streams, with the possible exception of excavation dewatering, should be carefully considered for ANWR. Based upon current experience on the North Slope, alternatives to dewatering of reserve pits should be used in ANWR. The management regime selected for drilling wastes could eliminate the need to discharge to the tundra or roads. Conventional dust control measures or water should be used instead of wastewater. The planning stage should identify specific disposal methods for liquid waste streams classified under the Federal Resource Conservation and Recovery Act (RCRA) and non-RCRA liquid oily-waste streams. Rinsates from tank, vessel and truck cleaning also must be disposed of properly. Consequently, both the oil field operators, and the oil field support service industry must have access to appropriate facilities. Underground injection, potentially an acceptable disposal solution for many of these waste streams in permafrost areas should be considered. Produced water disposal should be limited to subsurface techniques.

Unlined gravel impoundments have been used in other North Slope oil and gas developments to contain various wastewater streams. This technique may not be appropriate in ANWR because of its

limited effectiveness and its requirement for large amounts of gravel.

Comprehensive planning is needed to ensure that liquid waste disposal solutions are available for all users. This would allow all liquid waste streams to be accurately identified, characterized, and quantified along with an acceptable method for disposal. For example, subsurface disposal options should be available for use by the support service industry.

SOLID WASTE MANAGEMENT

Major sources of solid waste are drilling wastes, scrap metal, oily wastes, sludge from production facilities, construction debris, drums, junked vehicles, tires, abandoned buildings and facilities, and a host of other materials. It is critical that proper management of all these wastes be addressed from the beginning. Drilling wastes are of particular concern. The state's new regulations governing drilling waste disposal provide an appropriate starting point for proper waste management. However, newer technologies may prove of additional benefit in the future. Pulverization and/or liquification of solids may create the possibility for subsurface injection of both muds and cuttings. Use of portable tanks, better liquid-solid separation equipment, and centralized disposal could eliminate the need for individual reserve pits. A centralized mud plant is now in operation in Endicott.

Disposal of solid waste is another area for which careful planning can lead to development of proper facilities at the outset. Provisions for removal and disposal of abandoned debris from illegal dumping should be addressed by stipulation placed on successful tract bidders. Because it is often difficult to determine the source of abandoned debris, it would be desirable to implement a "no fault" policy by which such wastes are

routinely collected regardless of origin.

Plans for management of drums should be required as a condition of operation. They should include inventory and tracking, cleaning, crushing, backhaul and disposal of waste liquids or residues from cleaning.

Garbage and other wastes which may attract wildlife should be incinerated. Collection and storage of such wastes must also avoid attracting wildlife. Plans for collection of these wastes and for central incineration should be prepared and adopted as a condition of field exploration and development.

Dispcsal methods for solid oily wastes from tank bottoms, sludges, hydrocarbon waxes, oil contaminated muds and cuttings and spill debris require very careful evaluation. At Prudhoe, the North Slope Borough operates one of two permitted non-RCRA solid oily waste disposal sites in Alaska. Results from the operation of this site are mixed. Additional work and technology review are needed to develop acceptable solutions for this very difficult waste stream management issue. Incineration would provide the most reliable and complete solution to the problem. However, this is also more costly to the operators. Waste minimization and reduction techniques should be employed. There are no readily available disposal options for this type of waste.

Comprehensive solid waste material management plans could minimize the amount of waste to be disposed and could incorporate salvaging, reusing, and recycling materials. Backhaul of scrap metal and crushed drums are additional tools which could make most landfills in ANWR unnecessary. Ash and residue from incinerator operation could easily be consolidated into a single facility.

Comprehensive planning to develop solutions for solid waste

disposal must also enable the support service industry to have access to proper disposal options. Regional disposal facilities can also help prevent unnecessary proliferation of landfills.

Ultimate disposal of pipelines, flow stations, camps and related facilities should be addressed at the outset of ANWR planning so that a financial mechanism is in place to provide for proper disposal upon completion of use. Widespread efforts to reduce the volume of waste generation or backhaul materials are not in common use on the North Slope. Plans for ultimate disposition of existing facilities are unknown.

HAZARDOUS WASTE MANAGEMENT

Hazardous waste management is governed by stringent requirements under the federal Resource Conservation and Recovery Act (RCRA). The state has adopted hazardous waste regulations and is currently in the process of implementing them through a Memorandum of Understanding with the Environmental Protection Agency.

As with other waste streams, it is essential that acceptable disposal methods be available both to the oil field operators and to the support service industry. Comprehensive planning is needed to develop appropriate management facilities at the outset.

A joint Ad Hoc Task Group representing industry and government studied hazardous liquid waste disposal options for the North Slope. They recommended further study of the implementation of one or a combination of four waste management options: incineration, deep well injection, conservation and recycling and storage and transfer. This kind of planning and evaluation is essential to proper waste management and disposal.

OIL SPILL PREVENTION AND RESPONSE

Coordinated response capability should be required. Adequate oil spill contingency plans and secondary containment requirements for drums and small facilities are also important. Buffer zones should be established to isolate these facilities from sensitive areas. Contingency planning and timely field response to environmental mishaps is essential.

If field gas or refining capacity is available to supply fuels it should be made available to the support service industry. This will significantly reduce the occurrence of spills by eliminating fuel storage and piping for space heating and electrical generation. Local availability of refined products to all users would also eliminate haul road tanker spills.

AREA OF IMPACT

Many of the tools developed in other North Slope fields are directly applicable to minimize the "footprint" of individual drill sites and of the overall production effort. Appropriate facility siting criteria and buffer distances will also help maintain adequate levels of environmental protection.

Development plans should: 1) minimize the number of drill sites and production facilities while optimizing the layout of roads and pipelines; 2) provide for a limited number of intensive use material sites; and 3) centralize and consolidate support facilities. Consolidation of the service industry at Kuparuk provides an example of centralized support services in planning for ANWR.

Ice pads should be considered for all exploratory drilling. Ice pads may also be used for temporary stockpiling of overburden and muds and cuttings.

Restoration of the site at each stage from exploration through production can reduce the cumulative impact of development activities. Adequate drainage must be provided for all facilities to prevent impoundments and erosion.

The need for offshore structures should be carefully evaluated along with the cumulative impacts such structures may have on the coastal hydrographic regime.

Attachment 4

FINDINGS

Congress finds that the establishment of a joint state/federal interdisciplinary ANWR process will best accomplish the balance between the national interest for expeditious and cost-effective development of oil and gas and the national interest in providing optimal, effective protection of the land, waters, and the natural environments of this national wildlife refuge.

BILL LANGUAGE

Upon enactment the Secretary of the Department of the Interior shall serve as Federal Coordinator of a state/federal interdisciplinary Arctic National Wildlife Refuge process. The Federal Coordinator in complete coordination with the state and prior to the first lease sale shall:

A) establish a joint agreement with the State of Alaska for planning, research, stipulation development, design review, permitting, surveillance, monitoring, and enforcement;

B) plan, conduct research, review designs, monitor, permit, and conduct enforcement to ensure compliance

with applicable laws and the terms and conditions of any applicable certificate, rights-of-way, permit, leases, or other authorizations in a manner consistent with the joint state/federal agreement;

C) maintain records documenting all phases of oil and gas activities and keep the President, Congress, and the Governor of the State of Alaska informed of any significant departures from compliance and the extent the environmental and wildlife protection objectives have been achieved by issuing an annual report no later than the 31st of December of each calendar year;

D) establish reasonable reimbursement schedules to recover from the permittees or lessees on an annual basis those costs incurred by state and federal participants in the state/federal process, including all research, administrative, monitoring, enforcement and reporting costs associated with preleasing and leasing in the coastal plain.

Attachment 5

TESTIMONY OF G. THOMAS KOESTER
BEFORE THE SENATE SUBCOMMITTEE ON
PUBLIC LANDS, NATIONAL PARKS AND FORESTS
July 14, 1987

Thank you, Mr. Chairman.

My name is G. Thomas Koester. I am an Assistant Attorney General for the State of Alaska.

The State of Alaska opposes S.735 on both legal and policy grounds. As a legal matter, we view S.735 as an impermissible attempt to amend a major component of the statehood compact under which Alaska was admitted to the Union. As a matter of policy, S.735 would abrogate the historic compromise in public land law under which the United States changed its policy of disposing of federally owned lands to one of retaining title but dedicating the proceeds of those lands to the states in which the lands are located.

Section 35 of the Mineral Leasing Act of 1920, 30 U.S.C. § 191, currently governs the distribution of revenues from oil and gas leasing of federal public domain lands. Under that statute, 90 percent of those revenues are dedicated to the benefit of the states in which the lands are located. In the lower 48 states, this dedication takes the form of a direct grant of 50 percent of the revenues and deposit of an additional 40 percent in the Reclamation Fund, established under the Reclamation Act of 1902, 43 U.S.C. §§ 372 et seq. Because Alaska is not covered by the Reclamation Act, Alaska receives the full 90 percent under the statute.

This dedication of federal oil and gas revenues to the states represented a historic compromise in the history of public land law. Around the turn of the century, there was a major change in federal land policy. The traditional practice of federal land disposal to encourage development and western migration was abandoned, and a new policy of federal land retention was instituted. To compensate the states for this continued federal ownership, which in many cases precludes economic development and in all cases precludes state and local taxation, Congress dedicated 90 percent of the mineral leasing revenues from those lands to the states.

During Congressional consideration of statehood for Alaska, considerable attention was given to the distribution of mineral leasing revenues from federal lands in Alaska. The result of those lengthy deliberations was that the revenue distribution provisions of the Mineral Leasing Act of 1920 were expressly incorporated into the Alaska Statehood Act.

The provisions of a statehood act admitting a new state to the Union constitute a compact -- a legally enforceable contract -- between the citizens of the new state and the United States. Such a compact does not impose obligations only on one of the parties; instead, obligations are imposed on both the new state and the United States. The specific terms of such a compact are obligatory and subsequently cannot be unilaterally amended by either party. As the United States Supreme Court once noted with respect to the Act admitting Wisconsin to the Union, a statehood act provision is "an unalterable condition of the admission, obligatory upon the United States." Beecher v. Wetherby, 95 U.S. (5 Otto) 517, (1877).

Congress incorporated the Mineral Leasing Act of 1920 into the compact under which Alaska was admitted to the Union in section 28(b) of the Alaska Statehood Act. In part, this undoubtedly was no more than Congressional recognition of the long-standing policy, applicable to virtually all of the western states, of dedicating 90 percent of the proceeds of public lands to the

states in which the lands are located -- i.e., the historic compromise adopted in 1920.

At the same time, however, the legislative history of the Alaska Statehood Act makes clear that Congressional incorporation of the Mineral Leasing Act in the statehood compact also was Congress' way of partially compensating Alaska for the substantial amount of federal land which had been withdrawn and reserved by the federal government for various purposes, and the attendant loss of economic productivity caused by those withdrawals and reservation. Ironically, a number of those withdrawals and reservations were for wildlife refuges, the specific federal lands for which S.735 seeks to change the revenue distribution formula.

To fully appreciate Congress' incorporation of the Mineral Leasing Act's 90 percent entitlement for Alaska in the statehood compact under which Alaska was admitted, one must look at the facts confronted by Congress at that time. A significant concern during the deliberations on Alaska statehood was whether the Alaska economy was sufficient to support a new state and the essential government services which the new state would have to provide. Much of that concern was a result of the fact that more than 99 percent of all the land in Alaska was owned by the federal government. Little or no development had taken place because of federal land management practices, and federal land therefore was not contributing to the economic development of the territory. In addition, because it was federally owned, it would be exempt from any taxes which might be levied by a new state government.

To ensure that the new State of Alaska would have sufficient economic resources to meet the necessary expenses of state government, Congress included a substantial land grant in the Alaska Statehood Act. In doing so, however, Congress discovered that more than one-fourth of the land in Alaska -- more than 95 million acres -- was included in federal withdrawals and reservations, several of which were wildlife refuges. Those withdrawn and reserved lands appeared to include most of the valuable resources in Alaska.

As a partial remedy to this situation, which one committee report characterized as "the problem of federal reservations," Congress consciously granted Alaska 90 percent of the oil and gas leasing revenues from federal lands in Alaska. Characterizing this as one of the "major provisions" of the Alaska Statehood Act, Congress concluded that this would minimize the adverse impact of federal withdrawals on the new state's economic viability and would ensure that the new state would benefit from any development of the substantial resources which might be found within those federal withdrawals.
Attached to the printed text of my testimony are a number of excerpts from the legislative history of the Alaska Statehood Act which demonstrate that both supporters and opponents of Alaska Statehood were well aware that Congress was including, as part of Alaska's statehood compact, an entitlement to 90 percent of all oil and gas lease revenues from federal lands in Alaska in perpetuity. While it would serve no purpose to go over all of them in detail, a few examples illustrate the broader Congressional understanding.

Senator Barrett of Wyoming, a supporter of statehood for Alaska, authored the language of what became section 28(b) of the Alaska Statehood Act, the section that incorporates the Mineral Leasing Act into the statehood compact. During a Senate hearing on statehood for Alaska, he remarked: "So I think it would be eminently fair and just and right and proper, when we write this bill up, that we . . . let the Federal Government retain the title to the minerals except such public lands as are granted to you, but give the Territory now and the State of Alaska-to-be ninety percent of the income from the minerals under the Leasing Act royalties that come in from now on out." Later in the

hearing, he introduced the language that now appears as section 28(b) of the Alaska Statehood Act with the words: "I propose to insert a new section 21 on the last page of the bill and provide in here that 90 percent of the income from coal and 90 percent of the income from the leasing act minerals shall go to the new State of Alaska." He noted that the Secretary of Interior had suggested such a provision be included in the statehood bill.

Representative Dawson of Utah, also a supporter of statehood for Alaska, commented on the House floor that "[t]hese [revenue sharing] provisions are the foundation upon which Alaska can and will build to the enormous benefit of the national economy shared by her sister States."

Senator Talmadge of Georgia, an opponent of statehood, noted during the Senate floor debate that the Statehood Act land grant and the various revenue sharing measures, specifically including the entitlement to 90 percent of oil and gas leasing revenues, "have been referred to variously as a 'dowry' and 'the greatest giveaway of natural resources in the history of this country.'"

Finally, and perhaps most significantly, Senator Butler of Maryland, a statehood opponent, reminded his Senate colleagues that grants made in statehood legislation are irrevocable and cannot be changed by a subsequent Congress:

> A bill which grants statehood is not some minor piece of legislation, but is a major function of the national legislature. We cannot undertake to perform that function without reminding ourselves that we are asked to make a grant which cannot be revoked. We cannot, therefore, consider these bills as we would ordinary legislation in the sense that ordinary legislation may be amended or changed in subsequent years as experience dictates.

When placed in its proper historical perspective, it is not surprising that Congress included an entitlement to 90 percent of the proceeds from federal oil and gas leasing in the Alaska Statehood Act. The Mineral Leasing Act, and its revenue distribution formula under which 90 percent of the revenues from federal lands are dedicated to the states in which the lands are located, represents a historic trade-off in the development of public land law. In enacting it, Congress terminated its traditional policy of disposing of the public lands. Instead, it determined that the federal government should retain those public lands, but should dedicate most of the mineral revenues from those lands to the benefit of the states in which the lands are located.

Virtually all of the public land states were admitted to the Union prior to the enactment of the Mineral Leasing Act, and its dedication of 90 percent of public land revenues to the states, in 1920. As a result, the statehood acts admitting those states do not include a provision similar to the one incorporated in the Alaska Statehood Act. However, incorporation of the Mineral Leasing Act in the Alaska Statehood Act simply reflects the Congressional understanding that the Mineral Leasing Act indeed was a historic compromise and, as a result of that compromise, the public land states are to receive the benefit of 90 percent of the revenues from federal lands within their borders in return for the continued federal ownership and management of those lands.

Passage of this bill would significantly alter one of the carefully considered terms and conditions under which Alaska was admitted to the Union. It would be an impermissible unilateral attempt to amend the solemn compact between the national government and the citizens of Alaska. Alaska has not agreed to this modification of the compact between Alaska and the United

States and, without such agreement, it would have no force or effect.

It also would signal a marked departure from the historic compromise, under which Congress dedicated 90 percent of the proceeds of the public lands to the states in return for continued federal ownership, which has guided federal public land policy throughout the United States for more than six decades.

Alaska supports the goals of the Land and Water Conservation Fund. At the same time, the state is concerned that these goals not be accomplished at the cost of a fundamental change in the provisions of the solemn compact under which Alaska entered the Union and the historic compromise which has guided federal public land policy for more than two generations.

Thank you very much for the opportunity to testify on this bill. We hope that we can work constructively with this subcommittee and the Congress to improve the effectiveness of the Land and Water Conservation Fund without sacrificing Alaska's statehood birthright and more than sixty years of federal public land policy. Again, thank you very much.

Attachment 5

TESTIMONY OF JOHN W. KATZ
BEFORE THE SENATE SUBCOMMITTEE ON
PUBLIC LANDS, NATIONAL PARKS AND FORESTS
July 14, 1987

Mr. Chairman and members of the Subcommittee:

My name is John W. Katz. I am Director of State/Federal Relations and Special Counsel to Governor Steve Cowper of Alaska. With me today is Tom Koester of the Alaska Attorney General's office.

I will present an overview of the State's concerns with respect to S.735, and Mr. Koester will describe the legal underpinnings of our position. We appreciate this opportunity to explain the views of the State on this legislation.

The State must oppose the enactment of S.735 on legal and policy grounds.

In our opinion, such enactment would violate the solemn compact between the United States and the State of Alaska which is embodied in the Alaska Statehood Act. The Act incorporates Section 35 of the Mineral Leasing Act of 1920. As a consequence, the State is entitled to 90% of the governmental share of bonuses, rentals, and royalties derived from the leasing of certain Federal public lands within the State.

We view the Statehood Act as a binding contract which was entered into knowingly and voluntarily by the people of Alaska and by the Federal government through Congressional enactment. This contract can only be altered by the consent of both parties. It is also worth noting that the legislative history of the Statehood Act demonstrates the intent of Congress to adopt special revenue sharing formulae in Alaska in recognition of the large amount of Federal land located there and the lack of infrastructure and other needed development.

Another principal reason for Congress's decision to provide Alaska with a larger revenue share than that which pertains to other western states was the concomitant decision to deny Alaska access to the Federal Reclamation Fund. In essence, the fund gives reclamation states an additional 40% of the proceeds derived from oil and gas leasing. The fund is primarily utilized in the arid and semi-arid West for irrigation and the construction of impoundment projects.

Alaska's topography, harsh climate, short growing seasons, etc. led Congress to conclude that the Reclamation Fund should not become operative in the State. As a consequence, we have been denied many millions of dollars which would represent the State's share of mineral revenues that were included in the fund for subsequent allocation to other western states.

Further, it is important to note that S.735 implicitly amends the Reclamation Act of 1902 and thereby reduces the western states' share of revenues. Funds which would have been credited to the Reclamation Fund under existing law would be deposited in the Land and Water Conservation Fund and miscellaneous receipts of the Treasury under S.735. Similarly, S.735 amends the Refuge Revenue Sharing Act. Funds which would be divided between the county where the Refuge is located and the Federal government under current law would be divided between the states and the Federal government under S.735.

Although S.735 could affect other states and local governments, we believe that the bill targets Alaska for especially harsh treatment. This legislation purportedly would apply to any mineral leasing which occurs after the date of enactment within a National Wildlife Refuge. With the exception of the Delta Refuge in Louisiana, only the Arctic National Wildlife Refuge and perhaps other refuges in Alaska present any realistic likelihood of leasing within the foreseeable future. In other states, a combination of Federal law, policy, geology, and subsurface ownership greatly limits the prospect of the generation of significant Federal revenues from S.735.

Mineral revenue sharing formulae provided by the Federal government to the western states represent a very conscious decision to compensate these states and local governments for the existence of Federal lands over which they have little control and no taxing authority. S.735's amendment of the Reclamation Act, Mineral Leasing Act of 1920, the Refuge Revenue Sharing Act, and the Alaska Statehood Act establishes a precedent for future actions which would have greater monetary impacts on states and local governments. This precedent is particularly troubling because in many ways, Alaska's case for retention of its entitlement under the Statehood Act is more compelling from a legal and policy point of view than the arguments which could be mounted by other states. Therefore, S.735 could well mark the beginning of a slippery slope which could cause a deficit-conscious Congress to enact future legislation adversely affecting other revenue sharing formulae.

Mr. Chairman, we strongly support the purposes of the Land and Water Conservation Fund. Clearly, the fund fosters habitat protection and land acquisition, where appropriate, on Federal lands. However, our research indicates that the fund does not suffer from lack of sufficient revenue sources to achieve these purposes.

As you know, Congress has previously authorized the annual expenditure of $900 million from the fund. Yet, the amount of revenue flowing into the fund from sources previously designated by Congress exceeds this ceiling by a significant margin. Moreover, the Federal government has never spent more than two-thirds of the authorized amount, and in six of the last 10 years, the annual expenditure has been considerably less than half.

Thus, if the fund has not completely met its laudable objectives, the problem does not appear to be with the availability of sufficient revenues. Rather, the difficulty is with Congressional allocations at the other end of the funding process. If this is true, we are at a loss to understand why the enactment of S.735 is necessary, particularly in view of the considerations referred to previously.

Enactment of S.735 would come at a particularly difficult time in Alaska's history. The State still suffers from the lack of well developed infrastructure and other acute socio-economic problems. With the marked reduction in the world price of oil upon which Alaska is so dependent, our people are experiencing severely depressed economic conditions, including high unemployment, widespread mortgage foreclosures, and significant cutbacks in State services. While Alaska's leaders are doing their best to diversify the State's economy and to take other necessary measures, it may be years, if ever, before the State fully recovers. In these circumstances, to reduce possible revenues in the manner suggested by S.735 would represent an especially hard blow.

The Cowper Administration strongly supports oil and gas development in the coastal plain of the Arctic National Wildlife Refuge (ANWR), subject to appropriate environmental stipulations. We recognize that S.735, by altering existing revenue streams, might generate some additional support for opening ANWR. We believe, however, that there are many compelling reasons for authorizing such development without resorting to the indirect means contained in S.735. These reasons include the need to find new domestic oil sources at a time of rapidly decreasing production, to reduce our negative balance of trade, to enhance National security, and to create additional sources of revenue and jobs in Alaska and throughout the Nation.

Mr. Chairman, for the reasons outlined here, we respectfully urge the committee to forego any further action on S.735. Thank you for your consideration of our position.

Attachment 6

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DIV. OF OIL & GAS
DIRECTOR'S OFFICE

October 28, 1987

The Honorable Donald P. Hodel
Secretary
Department of the Interior
Room 6151
C St. between 18th and 19th Sts., NW
Washington, DC

Dear Mr. Secretary:

During our meeting last winter in Washington, D.C., we discussed the future of the Arctic National Wildlife Refuge (ANWR). As you recall, I shared with you my assessment that the proposed ANWR land exchanges between the department and various Alaska Native corporations are not in the national or state interest.

Since our meeting, your subordinates have continued to advance the trade proposals, including participation in an ANWR tract selection and award process during early July. This tract selection process awarded the participant Native corporations more than 166,000 acres of limited oil and gas interests in ANWR, valued by the department at approximately $538.7 million.

Based upon information regarding the selection process recently provided by the department, the State of Alaska continues to view the proposed trades as adverse to the public interest. Furthermore, as evidenced by recent events during congressional committee hearings on ANWR, the spectre of these trades continues to divert attention and hinder our mutual goal of opening ANWR to responsible petroleum production.

In order that there be no confusion regarding our stance in response to the proposed trades, I have outlined below the problem areas of greatest concern to the state.

First, I am concerned that the exchanges divert attention from the central issue of opening the Arctic National Wildlife Refuge. At least one U.S. Senator has said that his position on the central issue of opening ANWR would be decided on the issue of the land trades and that he would oppose development if the legislation included the exchanges. Precious time which could be spent on examining the relationship of ANWR to energy security has already been

lost as the key committees have responded to the land trades. Legislation in both houses clarifying congressional authority regarding the approval of the exchanges is the most tangible reflection of this diversion.

Given these uncertainties, I believe that the best way to ensure that the public receives proper compensation for the trade of specific tracts is to follow the competitive leasing process prescribed in the 1920 Mineral Leasing Act. Under this Act, competition and the system of royalties ensures that the public will be adequately compensated for the resources which have been leased.

Second, the exchanges propose to trade known surface values for unknown but highly prospective subsurface values. Although available seismic data indicate that ANWR is the most promising oil and gas frontier area in North America, these data are inadequate for purposes of a land exchange involving individual tract valuation. As a result, it is possible that extremely valuable tracts will be traded for inadequate compensation. Senator Johnston expressed this concern best when he said recently that he could not support this proposal because in the event that oil was discovered, he would be unable to explain why the U.S. exchanged mineral rights worth billions of dollars for land worth millions of dollars.

Further, I believe the public may well have been short-changed by the department's failure to also acquire Native owned subsurface estate (where available) as part of the proposed land trade. The retention by the Natives of the subsurface estate guarantees them the right to reasonable access and extraction of any minerals which may be present. This may well negate some of the public benefits claimed as a result of the proposal.

Finally, the proposed trades would unfairly deny the state its share of revenue under the 1920 Mineral Leasing Act. It is important to note that in 1983 the department traded subsurface lands in ANWR estimated as being worth $5.6 million to the Arctic Slope Regional Corporation. As a result, the state received absolutely no consideration and as recent events evolve, the federal government may well have significantly undervalued this acreage to the detriment of the public.

Last summer, my administration outlined an alternative process to the current trade proposal. Our alternative is but one method by which the department could employ the

usual competitive leasing process and still acquire the Native corporation refuge inholdings. Specifically, this alternative would award bid credits to the corporations equal to the value established by the department for their refuge inholdings. Each corporation could then use these credits to bid (as if they were actual dollars) in any competitive federal oil and gas lease sale (including those offshore or outside Alaska), or they might be independently sold to the highest bidder.

Although encouraged by your decision to temporarily put the entire exchange matter on hold, I sense that you intend to continue the process following further congressional briefings. While I would prefer that you end the process altogether, I am encouraged by your temporary hold order, as well as your public assurances that the trades will not be concluded administratively. I believe any attempt by the department to approve these trades administratively will only generate renewed enthusiasm and momentum for the ANWR wilderness bill.

In conclusion, I believe that the proposed trades hurt the national and state's interests, as well as our collective efforts to obtain congressional authorization for opening ANWR. Therefore, I support your decision to put this process on hold and strongly urge you to take no further action which would cloud the ANWR debate.

Sincerely,

S/S Steve Cowper

Steve Cowper
Governor

cc: Senator Ted Stevens
Senator Frank Murkowski
Congressman Don Young

SC/GG/j

100802

ALASKA DIVISION OF OIL AND GAS
CRITIQUE OF THE PROPOSED ANWR LAND EXCHANGES

The Department of the Interior (DOI) has tentatively agreed to exchange the subsurface rights to certain tracts within the Coastal Plain of the Arctic National Wildlife Refuge (ANWR) for the surface estate of certain Native Corporation inholdings from other federal refuges within Alaska. The methodology which DOI apparently employed in estimating the value of the oil and gas estate within ANWR is inadequate for that purpose, and its application under the circumstances is technically unsound. As a result, the individual tract values which DOI assigned to the ANWR lands are unlikely to approximate those that would result from a competitive auction. In fact, the actual value of those resources is currently unknown, and it could only be estimated with reasonable accuracy after the drilling, testing and production of numerous wells within ANWR.

In order to understand the inadequacies of DOI's appraisals, one must first recognize the distinction between oil and gas reserves analysis and oil and gas resource analysis. This distinction is crucial because DOI apparently has used a hybrid, poorly documented resource analysis procedure ostensibly to generate estimated values which, in fact, could only be estimated from a more sophisticated reserves analysis.

This review focuses primarily on the deficiencies of DOI's assessment of the potential amount and value of oil and gas underlying the proposed exchange lands. However, in addition to the uncertainties as to the actual volume of oil and gas which may be discovered in ANWR, there are equally critical uncertainties surrounding future price and cost estimates to develop those discoveries. The interplay of each of these factors--all of which are now highly speculative--will significantly influence the estimated values of the proposed exchange tracts.

Reserves evaluation is conducted only after the discovery and delineation of oil and gas deposits within a field. Reserve evaluation relies upon objective data gathered from the completion and testing of wells, its results are highly reliable and they are reproducible by independent analysts. On the other hand, oil and gas resource evaluation of prospective areas such as the Coastal Plain of ANWR usually is conducted before any wells are drilled. It is an iterative, probabalistic computer-assisted modelling procedure which relies upon numerous subjective estimates of potential reservoir characteristics. These subjective estimates generate a probability distribution of potential "outcomes" from hypothetical drilling. These "outcomes" are expressed as anticipated amounts of hydrocarbons associated with corresponding probabilities of occurrence.

These resource estimates are based on subjective assertions about possible geophysical and geological characteristics (parameters) of a particular region such as ANWR. The computer model specifies a method of sampling from pre-specified probability distributions of these characteristics. This sampling generates a joint probability distribution of reservoir characteristics. The correct combination of characteristics results in a

simulated hydrocarbon discovery. Other combinations generate a simulated dry hole. Thousands of passes through the probability distributions for each parameter result in the probability distribution of potential resource values. But note, the range of potential outcomes is dependent upon the subjectively determined range of values for each individual reservoir characteristic. Thus, resource estimates represent the "best guess" of both men and model as to the likely distribution and value of oil and gas resources. The accuracy of the "best guess" will be strongly influenced by the quality and quantity of available data. In the final analysis, only drilling will verify the estimates.

Both reserves analysis and resource analysis have particular applications, and each has its own unique limitations. Obviously, the purposes for which each is used are determined, among other things, by both the relative availability of objective geological, engineering and economic data and the degree of certainty which the analyst (usually an investor in the case of reserves analysis and a bidder in the case of resource analysis) is trying to achieve. Investors routinely rely upon detailed reserves analysis of a delineated oil and gas field to loan money to develop the field's reserves. The same reliance should never be placed on resource estimates.

Resource analyses typically are used by petroleum exploration companies as a management decision tool to compare the relative prospectiveness of frontier areas to assist in directing the companies' future exploration efforts. A much more sophisticated but similar modelling approach is used to estimate tract values for bidding purposes. The Minerals Management Service, the State of Alaska and the Bureau of Land Management also conduct independent resource analyses before competitive oil and gas lease sales on lands which they manage. These analyses serve two important functions. First, they provide some indication of the relative prospectiveness of each potential subsurface trap identified within an area proposed for leasing. Secondly, and of greater utility, they provide ranges of estimated tract values which are used to set bidding terms and establish minimum acceptable bonus bids.

The calculated minimum bid for each tract is used as a benchmark after the sale for determining whether to accept or reject the highest bonus bid submitted for each lease. The calculation of each tract's minimum bonus bid before a sale is a modelling exercise which relies upon the manipulation of many highly subjective values. In recognition of this fact, the numbers are not treated by government agencies as absolutes in deciding whether or not to accept the current high bids.

Although one can speculate about the range of values which a lease may have, the actual value of a given lease cannot be accurately estimated until the lease area has been thoroughly explored by the drilling and testing of exploratory wells. For each productive lease, the number of wells required to delineate adequately the underlying reserves and to accurately estimate their value is dependent upon the geological and economic characteristics unique to that lease. It is for this reason that the minimum bid for each competitively offered lease is not considered to represent the actual value of the resources

beneath the lease. It is simply one estimate based upon the then available information. In competitive leasing, the failure of a particular lease to attract the precalculated minimum bid simply means that additional considerations will be evaluated before a decision is made whether to award the lease or to reoffer it at a later date.

The determination that "fair market value" is being received in any competitive leasing program which relies upon resource analysis presumes that public value is measured by more than the bonus bids offered. In fact, resource analysis presumes that value received by the lessor may consist of future rentals, royalties and taxes in addition to the advance bonuses received from lessees for the right to explore and develop a lease. In many cases, high bonus bids are received for tracts which subsequently are found to be nonproductive; in others, relatively low bids may win leases which ultimately prove to be highly productive, and thus extremely valuable. This fact in itself illustrates the highly speculative nature of any analysis prior to drilling. To reiterate a point made earlier, "best guesses" are just that.

Under real world competitive circumstances, bonus bids represent a percentage of the firm's estimate of the net economic value of the lease (or economic rent). The percentage that the bonus represents will vary according to the firm's perception of the geological and economic risks attendant to the lease, as well as its assessment of the potential competition for the lease. This net economic value is a residual after all costs (including taxes and royalties) have been deducted from potential revenues and the net revenue has been discounted by a "risk adjusted" discount rate representing a normal rate of profit. The firm's potential net revenues are estimated by a procedure analagous to resource analysis.

Given the subjective nature of the resource evaluation process, either too much or too little is paid for a particular lease but, on average, the competitive process transfers the net economic value to the lessor. In the long-run, negative and positive windfalls should tend to offset one another.

In theory, the net result when numerous competitive sales are conducted over time is that fair market value is received for the leasing of the public resource. Competitive leasing can thus proceed in the face of the relative uncertainty surrounding resource estimates because, on average, the future royalty and tax "windfall" revenues from unanticipated exploration successes or from discoveries which far exceed pre-leasing expectations will tend to compensate for the anticipated royalties and taxes which never materialize from estimated highly prospective leases that turn out to be dry.

There is only one certainty with subsurface resource analysis--it can never accurately estimate before leasing and drilling the present value of the combined future bonuses, rentals, royalties and taxes which may be produced from a discovery on a lease tract. The wide variance in bids for a particular tract in a lease sale offers further evidence of this estimating problem. Yet, using methodology designed for resource analysis and relying upon data insufficient for the task, DOI claims to have calculated a value of each ANWR

tract which it proposes to exchange, and that this value is an accurate estimate of that tract's value. As the previous discussion indicates, this is highly unlikely. In fact, its evaluation is inadequate as an accurate present value estimate. However, just as important for the reasons described below, its utility as a responsible resource analysis also is largely discredited.

The geophysical data used to map the structures described in DOI's 1002 report constitute a reconnaissance grid which averages approximately three miles by six miles. Such a large grid size, when combined with the lack of well data control and the extremely complex geologic characteristics of ANWR, virtually guarantees that many potential oil and gas traps of significant size may not be recognized, while others will be so poorly defined that their dimensions and geometry will be misinterpreted. Far more detailed data would be required to define accurately the potential subsurface traps within the Coastal Plain of ANWR.

Amauligak, Gulf Canada's recently announced discovery in the Canadian Beaufort Sea, is approximately twenty-one square miles in area. That discovery, which contains an estimated 850 million barrels of recoverable oil, provides an excellent example of the problems associated with relying on a regional seismic reconnaissance grid and inadequate geological data to predict the value of ANWR tracts. Were that field located in the Coastal Plain of ANWR, it would be entirely fortuitous to recognize its existence, much less to define its limits accurately with the existing data. If a deposit this size--a giant oil field by world standards--cannot be detected or accurately mapped, it should be obvious that the tracts overlying it cannot be appraised accurately.

DOI undoubtedly failed to accurately estimate the value of those tracts where subsurface traps exist but cannot be identified from the existing data. However, in addition, it clearly failed to map numerous structures which can be identified from the reconnaissance data available. According to DOI's press release describing the July 1987 exchange selections, "...Of the 73 tracts identified, 34 were on potential oil and gas structures mapped for the 1002 study and report to Congress." However, based upon our independent mapping of the same geophysical data, every one of the 73 tracts selected for exchange lies above a structural trap. Further, all of the mappable four-way closures (representing the highest potential targets) have either been exchanged or selected for exchange.

It is clear from the selection pattern and our independent mapping of the geophysical data that the tops (structurally highest and most prospective portions) of all the best structures, including the very large prospects numbers 18 and 19 (from the 1002 study), as well as the numerous prospects aligned along the Marsh Creek trend, have been selected as a result of the ASRC and latest exchanges. This is precisely the same result that would be expected to occur if the Coastal Plain acreage were made available for competitive bidding and exploration by well-informed bidders.

Many of the structures which we have identified involve the relatively shallow Tertiary sediments, which apparently either were not mapped in detail or

completely analyzed by DOI. These structures involve sedimentary rocks which are the same age as those which produce the oil-stained outcrops along the flanks of the famous Marsh Creek anticline, the prominent surface structure which first attracted petroleum explorationists to ANWR. The selection of the overlying tracts by the Native Corporations and their industry partners indicates that they have recognized and mapped the underlying structures, and that they must have high regards for their oil and gas potential.

DOI concluded further that "...503 (85.5%) tracts not identified remain available for a federal leasing program and include 87.7% of the tracts over mapped structures." For the reasons described in the preceding paragraph, this is simply not the case. The fact that DOI apparently failed to identify the potential traps beneath many of the tracts which they propose to exchange does not alter the fact that they exist. The Tertiary structures obviously have some real value even though DOI has failed to map them in detail and to attribute proper value to them.

DOI dramatically downplays the potential detrimental effects of proceeding with the proposed exchanges in the absence of objective and independently reproducible determinations of the actual value for each tract. For DOI to claim, as it does in its press release, that "...these latest selections only represent a small (10.8%) percentage of the entire 1002 area." is disingenuous in the extreme. In fact, based upon our subsurface mapping, these selections, when considered in combination with the 1983 ASRC land exchange, would result in the noncompetitive conveyance of more than 250,000 of the most prospective acres within the Coastal Plain of ANWR. This amount represents approximately 18 percent of the entire Coastal Plain of ANWR.

To focus on the relative number of acres conveyed through exchanges as DOI does, however, is very misleading. It is the location of that acreage relative to the most prospective subsurface structures which is relevant, not the absolute number of acres exchanged. Relatively small but well-informed selections could effectively result in the exchange of all of the area's potential oil and gas reserves. The potential effect of a fortuitous selection involving a relatively small area is demonstrated by the Prudhoe Bay Field.

Although the entire area surrounding the Prudhoe Bay structure was recognized to be highly prospective before the first exploratory well was drilled, we now know that the vast majority of the prolific oil and gas reserves in that region are confined to a surprisingly small area. In fact, the surface area above the main producing reservoir of the giant Prudhoe Bay Field encompasses only about 180,000 acres. Fifty-nine percent of the reservoir's recoverable oil (5.9 billion barrels) lies beneath just 40,000 acres in that field, and fully 94% of the recoverable oil (9.4 billion barrels) lies beneath the best 100,000 acres of the field.

Among the millions of acres of state-owned lands between the Canning and the Colville Rivers, this particular 150,000 acres is uniquely valuable. DOI cannot assure the public that it has not already exchanged the subsurface rights to equally valuable lands within ANWR to the Arctic Slope Regional Corporation. Similarly, DOI can offer no guarantees that the proposed

exchanges will not potentially transfer billions of dollars in oil and gas reserves to other Native Corporations and their industry partners in return for 891,000 acres of surface estate with an estimated value of $538.7 million (not based upon fair market value appraisals).

The details of one particular exchange contract, that between Old Harbor and its industry partner, Texaco, illustrate quite clearly that the corporations will receive substantially more from the exploration of the tracts which they selected than DOI has claimed those lands to be worth. In this example, the total value of the corporation's exchange lands, and thus the value of the ANWR tracts it selected, was placed at $45.7 million by DOI. Yet, if ANWR is opened, the corporation's industry partner is committed to pay $45.7 million plus a 14 percent royalty on any oil and gas produced from those lands.

The DOI exchange procedures apparently neither estimate nor acknowledge the value of that 14 percent royalty interest. Whatever the amount may ultimately be, it would accrue directly to the corporation shareholders instead of to the federal (and/or state) treasury, as would be the case if the tracts were leased competitively. Furthermore, Texaco has agreed to pay Old Harbor a 1 1/2 percent royalty on any leased lands in the Coastal Plain not owned by Old Harbor.

In relative terms, the proposed land exchanges provide almost absolute economic protection for the Native Corporations with no parallel protection for the federal government. In fact, the exchange contract provisions virtually assure that any loss for DOI (and the public) will be a windfall for the corporations and their industry partners. In the final analysis, the exchanges are a no-loss proposition for the corporations, and a no-win situation for the public. Economic and geological risk has been transferred to the taxpaying public and a few select oil companies.

For example, one of the exchange contracts currently contains a rescission clause which enables the corporation to relinquish title to its subsurface estate in ANWR in exchange for the reconveyance of a portion--rumored to be as high as 65 percent of the surface estate which it has traded for the ANWR lands. In light of the total uncertainty surrounding whether the ANWR lands have oil and gas reserves, this provision was created to enable the corporations to regain title to a portion of their former surface inholdings should exploration by their industry partners prove unsuccessful.

However, if as has been reported, each of the corporations has already received advance cash payments from its respective industry partner for the future right to explore and develop the lands which it has selected, the corporations bear little or no risk in the exchanges. Their risk is offset effectively by the cash advances from industry. Moreover, this protection is further enhanced for any corporation that insists upon a rescission clause if its ANWR selections are nonproductive.

Under the same circumstances, however, the public interest will not fare so well. In exchange for an indeterminate number of abandoned exploratory well locations on the Coastal Plain for which it will regain title, DOI will have to reconvey title to some of the valuable refuge inholdings which it has temporarily received from one or more of the corporations. The stated basis for its proposed exchange literally will disappear. Meanwhile, DOI will have

foregone the undoubtedly high bonus bids, rentals and royalties which it could have received had it competitively leased the ANWR lands instead of exchanging them under noncompetitive procedures.

Of equal importance, should exploration prove unsuccessful, DOI will have assured the early condemnation of adjacent unleased acreage by allowing expedited drilling of the exchanged lands, all of which overlie portions of prospective subsurface structures. The absolute revenue loss from the premature condemnation of surrounding unleased acreage cannot be calculated should one or more of the exchange tracts prove to be dry. However, given ANWR's perceived hydrocarbon potential, the foregone bonus revenues, alone, could amount to hundreds of millions of dollars. Whatever that loss ultimately might be, it would not be industry's loss, and it would not be the Native Corporations' loss--it would be the public's loss. There is no effective way to limit the potential public revenue loss from the early condemnation of unleased tracts by drilling on adjacent exchange lands short of prohibiting the drilling of any additional exploratory wells in ANWR before competitive leasing occurs.

To assure that the corporations receive the full value of their inholdings, but that neither they nor their industry partners benefit from windfalls at public expense, would necessitate limiting total revenues to the full appraised value of those surface inholdings. From a public perspective it would make sense to limit the corporation's future revenues from its ANWR subsurface rights to the appraised value of its exchanged inholdings (plus interest) minus the cash advance it has received from its industry partner. Once the full appraised value (plus interest) of its surface lands is recouped, the corporation's interest in the subsurface estate would revert to the federal government, and the corporation's former percentage revenue share would subsequently accrue to DOI as a royalty on the continuing production.

A combined strategy of prohibiting additional drilling until after competitive leasing has occurred and limiting the Native Corporations' future revenues from exchanges to the appraised value of their surface inholdings would minimize the loss of public revenue. However, it would not remedy the worst flaw of the proposed exchanges, the fact that they simply are bad public policy. Proceeding with the exchanges would ratify DOI's precedent of substituting noncompetitive, negotiated exchanges which favor only a few companies and Native Corporations for open competitive leasing procedures which would treat all participants equally, and which assure the federal government's receipt of fair market value for the leasing of public resources.

In summary, DOI's resource analysis is no substitute for competitive sales as a means to estimate the value of the potential oil and gas resources which are proposed for exchange. However, that evaluation, which relies upon regional geophysical and geological mapping is adequate to establish a competitive leasing program in ANWR. The federal government's receipt of fair market value for ANWR's oil and gas resources can only be assured through a fully open and competitive leasing program which retains a significant royalty interest in any oil and gas reserves which are discovered and produced there. Both the Prudhoe Bay and the Amauligak fields provide graphic examples of why DOI's proposed exchanges entail unacceptable risks for prudent managers of the public resources.

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EXECUTIVE SUMMARY
OF THE ALASKA DIVISION OF OIL AND GAS CRITIQUE
OF THE PROPOSED ANWR LAND EXCHANGES

When combined with the 1983 ASRC exchange, the Department of the Interior's (DOI) most recent proposed ANWR land exchanges result in the non-competitive conveyance of more than a quarter of a million acres of the most prospective lands within the Coastal Plain of ANWR for a TOTAL VALUE OF ONLY $543.8 MILLION (the appraised value of the exchange lands tendered to DOI). In the ASRC exchange, DOI received surface estate appraised at $5.6 million in exchange for subsurface rights to approximately 92,000 acres of highly prospective mineral estate beneath lands owned by the Kaktovik Inupiat Corporation in the Coastal Plain of ANWR. The currently proposed exchange would convey the subsurface rights to an additional 166,278 acres of the remaining most highly prospective lands to six Native Corporation groups and their industry partners in exchange for 891,000 acres of surface estate with an estimated value of $538.7 million.

Although impossible to calculate, it is almost certain that a competitive lease sale of this same coastal plain acreage would generate substantially higher revenues than those resulting from the ASRC exchange and the latest proposed exchange. The value of the royalty interest alone, should significant discoveries occur, potentially may be measured in the billions of dollars. Bonus revenues are likely to be higher than the exchange values because the open competition in a competitive lease sale necessitates higher bids to "win" the most prospective tracts.

The details of one particular exchange contract, that between Old Harbor and its industry partner, Texaco, illustrate quite clearly that the corporations will receive substantially more from the exploration of the tracts which they selected than DOI has claimed those lands to be worth. In this example, the total value of the corporation's exchange lands, and thus the value of the ANWR tracts it selected, was placed at $45.7 million by DOI. Yet, if ANWR is opened, the corporation's industry partner is committed to pay to them $45.7 million plus a 14 percent royalty on any oil and gas produced from those lands.

The DOI exchange procedures apparently neither estimate nor acknowledge the value of that 14 percent royalty interest. Whatever the amount may ultimately be, it would accrue directly to the corporation shareholders instead of to the federal (and/or state) treasury, as would be the case if the tracts were leased competitively. In addition, the agreement provides that Texaco will also pay Old Harbor a 1 1/2 percent royalty from production by Texaco on any leased land in ANWR not owned by Old Harbor.

The uniquely high hydrocarbon potential of ANWR presents DOI with a one-time-only opportunity both to reduce the national dependence on foreign oil imports and to receive significant public revenues in the process. In acknowledging the extremely high upside resource potential and realizing the uncertainties attached to DOI's assigned value for individual ANWR tracts, a prudent approach, at the very least, would require that the federal government retain a significant royalty interest in future petroleum production from all the ANWR tracts.

The methodology which DOI apparently employed in estimating the value of the oil and gas estate in ANWR is inadequate for that purpose, and as a result, the individual tract values which DOI assigned to the ANWR lands are unlikely to approximate those that would result from a competitive lease sale. A reserves analysis, which relies upon objective data from the completion and testing of wells, would be necessary to establish a reliable value for the subsurface resources beneath the ANWR tracts. DOI has employed a resource analysis procedure which relies on probabilistic computer-assisted modelling of subjective geologic variables to assign values to the individual tracts. Subsurface resource analysis can never accurately estimate, prior to leasing, drilling, and testing, the present value of the combined future bonuses, rentals, royalties and taxes which may be realized from a discovery on a lease tract.

In addition to the limitations of resource analysis methodology, the utility of DOI's evaluation is further constrained by the inadequacy of data available in ANWR. The geophysical data used to map structures in ANWR constitute a reconnaissance grid which averages three miles by six miles. Such a large grid size, when combined with the lack of well data control and the extremely complex geology, virtually guarantees that many potential oil and gas traps of significant size may not be recognized.

Amauligak, a recent discovery in the Canadian Beaufort Sea with an estimated 850 million barrels of recoverable oil, is approximately twenty-one square miles in area. Were that field located in the Coastal Plain of ANWR, it would be entirely fortuitous to recognize its existence, much less to define its limits accurately with the existing data. If a deposit this size--a giant oil field by world standards--cannot be detected or accurately mapped, it should be obvious that the tracts overlying it cannot be appraised accurately.

According to DOI's press release describing the latest exchange selections, "...of the 73 tracts identified, 34 were on potential oil and gas structures mapped for the 1002 study and report to Congress." However, based upon the state's independent mapping of the same geophysical data, every one of the 73 tracts selected for exchange lies above a structural trap.

Further, all of the mappable four-way closures (representing the best potential target areas on the structures) have either been exchanged or selected for exchange. The fact that most of the industry selections do not overlie structures mapped by DOI in the final 1002 study indicates that DOI's mapping is incomplete. The actual exchange selection pattern reveals that the native corporations and their industry partners have recognized and mapped these underlying structures and that they apparently have high regards for their oil and gas potential.

The selection pattern and our independent mapping indicate that not only the mappable closures, but the tops (structurally highest and most prospective portions) of all the best structures, including the very large prospects #18 and #19 (from the 1002 study), and numerous prospects aligned along the Marsh Creek trend, have been selected already by the exchange participants, just as

would be expected to occur if the acreage were offered for competitive leasing and exploration by informed bidders. Based upon our current knowledge, the acreage remaining for any future competitive sales is situated over the structurally lower (and therefore less prospective) portions of the subsurface structures on which selections were made or on other less prospective unselected structures.

Together, the ASRC and latest proposed exchanges would transfer over 250,000 acres of the 1.53 million acre Coastal Plain (approximately 18 percent) into private ownership. However, to focus on the relative number of acres conveyed through exchanges, as DOI does, is very misleading. It is the location of that acreage relative to the most prospective subsurface structures which is relevant, not the absolute number of acres exchanged. Relatively small but well-informed or simply fortuitous selections could effectively result in the exchange of all of the area's potential oil and gas reserves.

It is the uniquely high upside potential of the ANWR acreage which is attracting the wide-spread exploration interest in the Coastal Plain. However, unsuccessful exploration on the exchanged lands, prior to leasing, is one possible outcome. The less prospective tracts in ANWR, those remaining after the exchange selections, could very well be condemned through early drilling of the exchange tracts, with a resultant loss in public revenues.

The incorporation of a rescission clause in any of the exchange contracts would enable a corporation to relinquish title to its subsurface estate in ANWR in exchange for the reconveyance of a portion--rumored to be as high as 65 percent--of the surface estate which it has traded for the ANWR lands. The effect of this particular stipulation, when combined with the advance cash payments the corporations are reported to have received from their respective industry partners, places the corporations in a very enviable low or no-risk position. The public interest does not enjoy parallel protection, however. In exchange for an indeterminate number of abandoned exploratory well locations on the Coastal Plain for which it will regain title, DOI will have to reconvey title to some of the valuable refuge inholdings which it has temporarily received from one or more of the corporations. Under these circumstances, the stated basis for the proposed exchange literally will disappear.

The federal government's receipt of fair market value for ANWR's oil and gas resources can be assured only through a fully open and competitive leasing program which retains a significant royalty interest in any oil and gas reserves which ultimately may be discovered and produced there. The fairness and equity offered by competitive leasing procedures are in marked contrast to the terms of DOI's proposed exchanges. Those exchanges are not equal value exchanges. In fact, the actual value of the ANWR lands proposed for exchange cannot be determined prior to the drilling and testing of numerous exploratory wells on the tracts.

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THE ANWR LAND EXCHANGES

QUOTES CONCERNING THE RESOURCE ANALYSIS METHODOLOGY

Resource analysis methodology can neither determine the actual dollar value of the individual 2,560 acre ANWR tracts nor the true, fair market value of those tracts. The methodology is limited by the available ANWR data and by the fact that it can only provide a **range of subjective estimates** of tract value.

Quotes on Limitations of Methodology:

1. From Koniag, Inc. Proxy Statement, October 8, 1987, page 30:

   "...there is substantial uncertainty as to the value of the Oil and Gas EDP (Exploration, Development and Production) Interests and the value of the contingent interests under the Lease Agreements." (emphasis added)

2. From Old Harbor Proxy Statement, August 28,1987, page 10:

   "...nor can there be any assurance that the values set by DOI fairly estimate the oil and gas potential in the ANWR tracts selected by Old Harbor."

3. From the Energy Information Administration Service Report, Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge, Revised Edition, October, 1987:

   page 11: "Without the benefit of exploratory drilling on site, both kinds of estimates include significant subjective judgements; and, estimates of in-place and econmically recoverable oil are both best described in terms of probability distributions."

   page 19: "It should also be understood that any probabilistic assessment of recoverable crude oil reserves is basically judgmental -- in spite of the scientific appearance of complex computer models that may have been used in deriving it."

4. From attachment to memo to ANWR Land Exchange Negotiating Team from Bill Horn, June, 1987.

   "Devoting sufficient resources to appraising the oil and gas development value of the ANWR is certainly an important ingredient in achieving fair market value for the public's resources." "...appraisals in and of themselves do not ensure receipt of fair market value. Receipt of fair market value can be ensured under adequate, open competition among willing but not obligated buyers and sellers."

5. From the Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment, 1987, Volume 1:

   "The existence of potential hydrocarbon formations or prospects is not known with certainty prior to exploratory drilling. Information concerning the existence of potential producing fields is derived from inferences, extrapolations and subjective judgments."..."No data are available on the nature and distribution of included hydrocarbons or whether hydrocarbons are present at all. **An exact prediction of resource quantities under such conditions of uncertainty is impossible because the uncertainties in the input data translate to uncertainties in the answers**." (emphasis added)

6. In Decision Analysis for Petroleum Exploratin, Paul D. Newendorp, 1975, page 368:

   "...we must not fall into the error of believing that because we have attached a number to a chance that we have thereby made a successful issue more sure, or have in any way altered its probability. Further, we must be ever on the watch for that most insidious and widespread superstition that assumes that mathematical manipulation, if sufficiently accurate, involved and prolonged can transmute doubtful data into positive scientific fact."- Hayward, 1934.

THE ANWR LAND EXCHANGES

SUMMARY OF WHAT THE ANWR DATA AND THE RESOURCE ANALYSIS METHODOLOGY CANNOT DO

The Coastal Plain Data

Neither the precise location, the type nor the amount of petroleum resources beneath the ANWR coastal plain are known at this time. Although the KIC well data may provide tremendous additional insight, the geologic and geophysical data are simply insufficient to determine exactly what is there with a high degree of confidence.

Resource Analysis Methodology

This methodology cannot provide the **actual dollar value of the subsurface oil and gas rights beneath individual 2,560 acre tracts in ANWR.**

The methodology is inadequate for that purpose because it can, at best, only provide **a range of estimates of value, not the actual value.**

The actual value of each of the ANWR tracts will only be known after the reservoir(s), if there is one, has been fully produced. For only then will the geologic and economic variables (price of oil, cost of infrastructure, etc.) have revealed themselves.

DOI's ANWR tract values are merely one set of estimates based on one groups' assessment of numerous SUBJECTIVE input variables, such as size and exact location of the potential trap(s), thickness of potential productive reservoir rocks, gas/oil mix, percent fill of the trap(s), future price of oil, timing of development, transportation costs, etc.

There are no studies, to our knowledge, which show more than just a random correspondence between actual competitive bids and either BLM's or MMS' pre-sale, minimum acceptable bid estimates. The actual bids are generally much higher than the estimates.

DOI's single point **estimates** of value for each of the 576 individual ANWR tracts **are not the actual value of those tracts--however, perhaps more importantly, they are also not the FAIR MARKET VALUE of the ANWR tracts.**

FAIR MARKET VALUE is established only in open, competitive bidding in a traditional competitive lease sale.

The terms of both the Old Harbor-Texaco and Koniag-Chevron Group/Phillips lease agreements indicate some measure of what the **minimum fair market value for the ANWR tracts acquired in those agreements might be.** It is a minimum value because the process was non-competitive, with only the partner companies involved.

THE ANWR LAND EXCHANGES

SUMMARY OF WHAT THE ANWR DATA AND RESOURCE ANALYSIS METHODOLOGY CAN DO

The Coastal Plain Data

The data collected from the coastal plain of ANWR and adjacent areas consist of about 1300 line miles of seismic surveys constituting a reconnaisance grid approximately 3 by 6 miles, other regional geophysical surveys, surface geologic information, and subsurface geologic information from wells drilled outside the coastal plain area.

The data are sufficient to support and defend the conclusion that the coastal plain of ANWR has **extremely** high potential for holding commercial quantities of petroleum.

The data are also sufficient to identify many of the larger, potential subsurface traps beneath the coastal plain, enabling informed groups to high-grade (in the non-competitive selections or in competitive bidding) the most prospective tracts based upon the current knowledge.

The selection pattern clearly indicates the correlation between the currently known, most prospective subsurface structures and the most desireable tracts.

Resource Analysis Methodology

This methodology is commonly used to provide a **risked, probabilistic range of estimates of undiscovered, recoverable resources (in barrels of oil or cubic feet of gas) in potential hydrocarbon-bearing traps in the subsurface.**

The methodology can be an effective management decision tool to help a company compare the **relative prospectiveness of different frontier areas and specific regions within those broad areas.**

The estimates of undiscovered, recoverable oil and gas, when combined with unknown, but estimated, future economic variables, can be used to define **a minimum acceptable bid range (in dollar value)** for the purpose of evaluating bids in a competitive lease sale.

THE ANWR LAND EXCHANGES

SUMMARY OF THE IMPACT OF THE EXCHANGES

The Department of the Interior (DOI) in its press release on the land exchanges dramatically downplays the impact of the exchanges when it is quite clear that the selections, in effect, transfer the subsurface petroleum rights to the most prospective portions of the coastal plain to a few select companies and Native corporations in a non-competitive process.

The selection pattern, when overlain by the major structural trends maps (the trends that are likely to be traps or contain multiple traps), reveals that the most prospective ANWR tracts have been selected in either the 1983 ASRC exchange or the currently proposed exchange.

The selections target the structurally highest portions of the very large prospects #18 and #19 (from the 1002 report), as well as the prospects with a chance for closure aligned along the major Tertiary thrust fronts.

All tracts within the boundaries of the 26 structures identified in the 1002 report are not equally prospective. Those tracts which overlie portions of structures that exhibit closure in all directions, and those tracts which overlie the highest parts of the structures are the most favorable. These are, in large part the tracts that have been selected for exchange.

Questions for the ANWR Exploration Experts

One measure of the relative prospectiveness of the lands already exchanged or proposed for exchange is revealed in the answers to the following questions which can be asked of explorationists with specific knowledge of all the ANWR data:

1. Would you rather own the approximately 266,000 acres (about 100,000 acres in the previous ASRC exchange and about 166,000 in the currently proposed exchange) already exchanged and selected for exchange in ANWR, or the entire remaining acreage (approximately 1.25 million acres) of the coastal plain?

2. Disregarding the previous ASRC exchange lands, would you rather own the approximately 166,000 acres selected in the currently proposed exchange, or any other 166,000 acres of the coastal plain?

3. Again, disregarding the previous ASRC exchange lands, would you rather own the approximately 166,000 acres selected in the currently proposed exchange, or the entire remaining coastal plain acreage (approximately 1.25 million acres)?

THE ANWR LAND EXCHANGES

SUMMARY OF DOI'S FAILURE TO RECEIVE FAIR MARKET VALUE

In order to estimate the undiscovered recoverable oil resources for an area, it is necessary to produce maps of all of the individual prospects.

Many of the selections made by the Native groups and their industry partners in ANWR, by DOI's own admission, overlie prospects which DOI failed to map. Therefore, DOI would have been unable to estimate dollar value for the resources contained in these "unmappable" prospects.

Many of the selections overlie the elongated, northeast-southwest oriented structural trends that involve the Tertiary and Mesozoic rocks in major thrust-related folds.

DOI was unable to produce maps of these potential hydrocarbon-bearing structures, as illustrated in the following direct quotes from the final 1002 report.

However, DOI attributed a minimum value of about $300 per acre to most of these tracts based on unknown considerations and methodology. The industry partners obviously attributed great value to these tracts since they were selected by them in the non-competitive selection process.

Quotes from the 1002 Report:

> p.67: "No prospects were adquately resolved within the detached and highly deformed Mesozoic and Tertiary rocks." "...the probability of traps occurring in the subsurface in this structural setting is high, although determining their location on the basis of existing seismic data is difficult."
>
> p. 76: "The estimate of economically recoverable oil resources for the 1002 area represent an assessment of only the structural prospects which were identified on the basis of seismic interpretation." (emphasis added)

These quotes reveal that recoverable resources were estimated only for the 26 seismically mapped structures; none of the major Tertiary/Mesozoic structural trends (over which many selections were made) were adequately resolved to even attempt estimates of resources or dollar value.

As revealed in the Koniag-Chevron Group/Phillips and Old Harbor-Texaco lease acquisition agreements and in the fact that DOI assigned only a minimum value to many tracts where prospects could not be mapped or identified, the native corporations stand to receive substantially more from the exploration of the tracts which they selected than DOI has claimed those lands to be worth.

THE ANWR LAND EXCHANGES

SUMMARY OF THE VALUE TO BE EXCHANGED

For the purpose of the 1983 ASRC ANWR land exchange, DOI originally estimated the subsurface mineral rights of the approximately 100,000 acres of the ANWR coastal plain to be conveyed to ASRC to be worth about $388.5 million, of which $111.8 million represented the bonus value and $276.7 represented the royalty value.

Through a discounting process that considered Alaska's 90% statutory revenue share, and the application of risk factors related to the likelihood of opening and ultimate ownership, the original value of $388.5 million was reduced downward to a final total value about $5.9 million.

DOI conveyed the subsurface mineral rights to the approximately 100,000 acres of the coastal plain for the surface rights to about 100,000 acres in the Chandler Lake area which had an attributed value of $5.1 million.

In the currently proposed exchanges, DOI stands to receive about 891,000 acres of refuge inholdings with a total NEGOTIATED value of about $538.7 million. DOI retained no royalty interest in any of the ANWR exchange lands.

The Native groups and their industry partners stand to receive the subsurface mineral rights to about 166,278 acres of highly prospective coastal plain acreage, valued by DOI for the purpose of this exchange at about $538.7 million.

The proxy statements of Old Harbor and Koniag, Inc. reveal that these Native corporations will transfer the oil and gas rights to their industry partners for cash payments which approximately equal the total value DOI attributed to the ANWR lands selected PLUS SUBSTANTIAL royalty interests in any production from those lands and certain other ANWR lands their partners may acquire.

Old Harbor stands to receive ryoalty payments of 14% on the lands it selected plus 1.5% on certain other ANWR lands their partner, Texaco may acquire.

Koniag stands to receive royalty payments of 20% (which can be converted to a 40% net profit share) on the lands it selected plus 0.51% and/or 0.255% on certain other ANWR lands their partners, the Chevron Group and Phillips may acquire.

The terms of the lease acquisition agreements between the other four Native entities and their respective industry partners are not known.

THE ANWR LAND EXCHANGES

SUMMARY OF THE BASIS FOR
INDUSTRY BIDS IN A LEASE SALE

Historically, competitive lease sales, even in high potential areas, have drawn much interest from some oil companies, and very little from others. The bidding in a sale can be very diverse; some tracts, usually those perceived as having high potential, oftentimes receive a wide range of bids. On the other hand, certain other tracts may be highly attractive to some companies but of no interest to others.

Oil companies determine their specific bidding strategies based upon certain of the following considerations:

1. The company's resource evaluation based on geological and geophysical interpretation of the subsurface.

2. The company's current lease holdings adjacent to sale area.

3. The nearby production facilities the company operates.

4. The degree of competition anticipated from other oil companies for specific tracts.

5. The company's exploration budget allocation for bidding in the lease sale.

6. The company's current tax situation.

7. The terms of the lease sale (bonus variable, net profit, royalty, length of lease, etc.).

SUMMARY OF THE OLD HARBOR-TEXACO ANWR LEASE ACQUISITION AGREEMENT

Source: Old Harbor Proxy Statement, August 28, 1987

Old Harbor Native Corporation may exchange the surface estate of approximately 90,000 acres of its land with an attributed value (negotiated by Old Harbor and Department of the Interior) of about $45.7 million for the subsurface oil and gas rights to approximately 58,000 acres in ANWR, valued by DOI at about $45.7 million.

Major Points

* **Texaco makes a total cash payment of at least $45.7 million to Old Harbor for the lease option.**

* **Texaco pays a 14% royalty to Old Harbor on production from Old Harbor's ANWR leases and a 1.5% royalty from production on any other leases acquired by Texaco in ANWR.**

* **Old Harbor retains an easement to the surface lands it exchanges and subsistence rights to use those lands in perpetuity.**

Specific Terms

1. Texaco reimburses Old Harbor for expenses Old Harbor incurs in the land trade process.

2. Texaco pays Old Harbor $5 million in a lump sum and $50,000 quarterly payments immediately upon shareholder approval of the agreement. The quarterly payments run until the required opening legislation is passed, or December 31, 1993, whichever comes sooner.

3. Texaco pays Old Harbor $2 million in a lump sum upon congressional passage of the required opening legislation.

4. Texaco pays Old Harbor $38.7 million after opening legislation and lease acquisition.

5. Texaco pays Old Harbor a 14% royalty in any production from Old Harbor's ANWR leases.

6. Texaco pays Old Harbor 1.5% royalty on production from any other ANWR tracts which Texaco acquires.

7. Texaco agrees to make an effort to train and employ Old Harbor residents, and provide a $10,000 annual scholarship fund for Old Harbor children.

SUMMARY OF THE KONIAG-CHEVRON/PHILLIPS ANWR LEASE ACQUISITION AGREEMENT

Source: Koniag, Inc. Proxy Statement, October 8, 1987

Koniag, Inc. may exchange the surface estate of approximately 112,564 acres of its land with an attributed value (negotiated by Koniag and Department of the Interior) of about $77.4 million for the subsurface oil and gas rights to approximately 3,186 acres in ANWR, valued by DOI at about $77.4 million.

Major Points

* The Chevron Group and Phillips make a total cash payment of at least $58.3 million** to Koniag for the lease option. The final cash payment is likely to be in excess of $60 million.

  **note: For less than one-half interest (49%) in the Koniag leases, Phillips pays the bulk (about $55 million) of the total cash payment.

* The Chevron Group and Phillips pay to Koniag:

  1) a 20% royalty (which can later be converted to a 40% net profit share) on production from Koniag's ANWR leases.

  2) a 0.51% royalty on production from any other leases acquired by the Chevron Group within six miles of Koniag's ANWR leases.

  3) a 0.255% royalty on production from any ANWR leases acquired by the Chevron Group that were not recommended for selection by Koniag by the Chevron Group and which corner on or are contiguous to the Koniag leases.

* Koniag retains an easement to the surface lands it exchanges and subsistence rights to use those lands in perpetuity.

Specific terms

The Koniag lease acquisition agreement provides the Chevron Group with a 51% working interest and Phillips with a 49% working interest in the oil and gas exploration/development/production rights in Koniag's ANWR leases.

1. The Chevron Group makes an execution payment to Koniag of $510,000.

2. The Chevron Group makes quarterly interest payments to Koniag on an assumed principal escrow account balance of $2.55 million. To date, $322,960 has been paid.

3. The Chevron Group makes four progress payments of $255,000 each to Koniag upon the occurrence certain events, such as

reaching agreement with DOI on the exchaange lands, shareholder approval and execution of the agreement by Koniag and the Secretary of the Interior.

4. The Chevron Group pays to Koniag approximately $1.8 million upon lease issuance and satisfactory opening legislation (subject to downward adjustments based on prior overpayments).

5. The Chevron Group pays to Koniag "drilling premium payments" totalling about $1.7 million (less prior credits) subject to the occurrence of actual drilling within an advantageous timeframe.

6. The Chevron Group pays to Koniag a "bonus differential payment" equal to 51% of the amount by which the average per acre bonus of any federal ANWR leases the Chevron Group acquires in lands proposed by the Chevron Group for selection by Koniag, exceeds three times the average per acre bonus amount the Chevron Group would have paid Koniag had such land been selected by Koniag.

7. The Chevron Group pays Koniag a 0.51% royalty interest on production from any lands acquired by the Chevron Group within six miles of the Koniag ANWR leases.

8. The Chevron Group pays Koniag a 0.255% royalty interest on production from any ANWR leases acquired by the Chevron Group that were not recommended for selection by Koniag by the Chevron Group which corner on or are contiguous to Koniag's ANWR leases.

9. Phillips pays Koniag $1.0 million upon execution of the agreement.

10. Phillips pays Koniag $7.25 million upon enactment of acceptable opening legislation.

11. Phillips pays Koniag $27.5 million upon issuance to Phillips by Koniag of the Koniag ANWR leases.

12. Phillips pays Koniag $19.25 million upon the third anniversary of lease issuance.

13. The Chevron Group and Phillips pay Koniag a 20% royalty on production from Koniag's ANWR leases. The 20% royalty can be converted by Koniag to a 30% net profit share at the time total proceeds from production exceed exploration/development expenditures, or a 40% net profit share when total proceeds exceed twice the lessees expenditures.

14. The Chevron Group and Phillips pay Koniag approximately $29,000 in annual rental payments for the twelve years of the lease term.

The CHAIRMAN. Thank you very much, Ms. Moran.

Next we are pleased to have Brooks Yeager, Vice President for Government Relations at the National Audubon Society.

STATEMENT OF BROOKS B. YEAGER, VICE PRESIDENT FOR GOVERNMENT RELATIONS, NATIONAL AUDUBON SOCIETY

Mr. YEAGER. Thank you, Mr. Chairman, and I appreciate the opportunity.

The CHAIRMAN. Let us see. That is a promotion for you, is it not?

Mr. YEAGER. Well, some people think so. And I am happy to have it.

The CHAIRMAN. I hope a pay raise went with it.

Mr. YEAGER. I am pleased to be back and testify before you even if it is in a new capacity, and I appreciate the opportunity to come and talk a little bit about some of the issues that face the committee and the Congress as it tries to decide whether or not to open the coastal plain of the Arctic to oil and gas development.

Since I am here on behalf of Audubon, let me say first or restate Audubon's position in regard to this issue, and that is that the coastal plain should be managed and protected as wilderness unless impartial scientific judgment concludes that, number one, the potential oil resources of the coastal plain represent the only method for the nation to meet its energy needs and, number two, that the extraction of these resources can be accomplished without damage to the outstanding wildlife and wilderness resources which the refuge was created to protect.

We recognize that is a high criteria, and I think the reason that the board of directors of the Audubon Society chose such a high criteria is—has been evidenced in the statements to the committee during the many hearings that you held last year on this issue. The unique quality and the particular fragility of the wilderness ecosystem which is at the heart of the Arctic National Wildlife Refuge has been internationally recognized arguments for its conservation have been made not only by the U.S. domestic environmental groups, but by the Canadian government and the International Union for the Conservation of Nature.

I would also note particularly in response to Senator Murkowski's question of how much wilderness is enough that the Arctic coastal plain which is, as I understand it, 110 mile stretch, is the only area of the North Slope of Alaska which is not open in one form or another to oil and gas leasing development and exploration at the current time.

We believe that the coastal plain of the Arctic National Wildlife Refuge is the kind of Resource that a society taking a long-range view of its future would try its utmost to protect, not to compromise unless and until its development was the last resource which we could turn to to maintain the energy security necessary to our basic livelihood. You might call it saving the best for last, but I think we believe that there are many options that are open to us that would obviate the necessity of ever turning to this area.

I did not want to go over a lot of the testimony that was given even by the environmental groups during the last Congress on this issue. It is in the record. I wanted to note, though, particularly for

new members of the committee that a number of myths have been stated and restate about the development of the Arctic National Wildlife Refuge and that we believe that the testimony, if it is read carefully, generally serves to undermine those myths. And it might be a valuable exercise to look at them briefly.

The first one is that the development of the oil resources, the Arctic coastal plain is necessary as a matter of national security to ensure against oil shocks over the next decade. Since Ms. Speer spent much of her testimony on the issue of pollution problems and current Arctic development, I thought I would try to deal mostly with the energy situation that Senator Domenici raised as the surrounding context of an important issue in this decision.

We believe that the testimony will show that the Arctic National Wildlife Refuge has virtually no relevance to short-term oil disruption problems that the U.S. may face in the next five to ten years. And that is simply because the development time line will not allow for it to be a factor in such issues.

It does seem to us that this committee and under your leadership, Chairman Johnston, has taken some important steps to deal with those issues and that those steps have, in fact, had a good effect principally.

Your demand and insistence that the strategic petroleum reserve be filled at a more rapid pace than the last administration would have wished has allowed even a Secretary of Energy during the last administration to report that the United States is better prepared to meet oil disruptions than at any time time since the 1950s.

The second myth that has been raised is that the development of the Arctic coastal plain is somehow the cornerstone of our oil security over the next century. I believe the word cornerstone was used by Secretary Hodell in addressing this issue last year.

In fact, we think that it is a mistake, if not an absurdity, to think that a remote pool of rather expensive oil, even if it is quite large, as the Interior Department hopes, can be the cornerstone of the nation's energy security policy over the next 25 to 50 to 100 years.

There clearly are a welter of ambiguities about the amount of oil that will be available from the Arctic coastal plain and at what price various amounts of oil might be commercial to produce.

On the other hand, as I will emphasize in my testimony, there is virtually no uncertainty as to the tremendous gains that this nation could make by increasing the efficiency of its automobile and light truck fleets by better weatherization of its residential and commercial buildings, by a number of steps that our cheap trading partners are making in the international economy to make their economies more energy efficient.

The third myth is that the coastal plain, which has been restated in various forms, the coastal plain is a barren wasteland, and it is really not worth the effort to protect it.

I would only say in response to that that for those of you who have seen the centennial issue of the National Geographic, which is—the U.S. Geographic Society not really known as a major environmental group, but I think is turning its attention to environ-

mental ways. They chose to focus on the coastal plain as being a key North American resource that was in danger.

I also brought for the Committee a copy of Audubon's May 1988 national magazine, which is devoted almost entirely to the wildlife values of the coastal plain. And I thought that we could put it in your Committee files and maybe the new members would want to take a look at that at some point.

The CHAIRMAN. We would like that very much.

Mr. YEAGER. The fourth myth that I think that Ms. Speer dealt with largely is that the Prudhoe Bay experience has proven that oil and gas development can take place in a way that is compatible with the values that are represented by the Arctic coastal plain.

Collequially we know that as the "caribou love pipelines" theory. But I think that there has been an enormous amount of testimony that has been presented to the Committee and to other committees in the Congress that shows that while you may make a reasoned judgment, that it is more important to open the coastal plain for oil and gas development than it is to protect the resources for which it is now committed. That that will cause damage, and that the damage will be inescapable, and that it is a choice really to sacrifice one set of values in order to obtain another set.

That raises the question for us about whether we need to make such a sacrifice, and about a question that you yourself raised, Mr. Chairman, about the orderly development of resources.

I have not a lot of points in my testimony about the context of this issue and national energy policy as we view it. I would like to really skip over most of that, and if I could I would submit for the Committee's record a copy of a report that I was the author of last year called Wasted Energy, that was cosponsored by the Aududon Society, the Sierra Club, and Friends of the Earth, which deals with these issues in detail.

And I would like to emphasize only those portions of my testimony that relate to development since last year's hearings and since that report was published. Those are really several.

One is that we seem to be in a new era of energy policy. If we had asked the question 15 years ago about whether the development of the Arctic coastal plain fit in with some national energy strategy, we might have reached a different answer than we might if we examined that question carefully today.

Not only has your Committee and the Congress led in the effort to make the American economy somewhat more resilient with regard to immediate oil price disruptions, but we have the example of 10 years of solid progress in energy efficiency and conservation which essentially is at the root of the current oil industry problem in the United States.

The report, Wasted Energy, argues largely that, although we are producing less oil domestically than we were 3 years ago—I believe it is now more than a million barrels a day less—that that is not because we are running out of oil.

That is because our oil in the United States is largely not price-competitive with many sources of foreign oil, that the international oil market has, oil price has bottomed out in some respects, and that because many of our reserves either require more capital to produce because they are tertiary or secondary reserves in existing

reservoirs, or because they are remote oil fields like on the North Slope or the OCS, that they are not price-competitive and therefore we are not producing what we could produce.

The point of saying that is that there seem to be some question on the Committee, particularly from Senator Burns, about where our next oil is going to come from. And in fact, people have a lot of ideas about that, but it depends in many respects on the international price of oil, whether those things can happen and what kind of fashion they can.

The report quotes a number of oil industry analysts, including Dr. Fisher, who is the head of the Texas Bureau of Economic Geology, as showing the immense oil resources that still exist even in the lower 48 states, at prices of up to $25 a barrel.

We have also noted that since the report was produced, that the oil industry itself has proclaimed a number of major or exciting new discoveries, particularly on the North Slope. The Point McIntyre discovery that was recently made that had a test well producing at 2,500 barrels a day, as well as the enormous oil industry interest in the Chukchi Sea, which as I understand it has been proclaimed by both Texaco and Shell as being another potential international super-giant oil field.

If that is true, the question that we ask is why we would turn to the Arctic coastal plain first. If the Committee feels a responsibility to discuss the issue and to in effect try to promote an orderly development of American resources, would we not wait for the most fragile area last?

Why would we not see whether these new developments do pay off before making an irrevocable commitment to allow the development of the coastal plain?

The other development that I think we feel ought to be brought to the Committee's attention—I know you are undoubtedly aware of it, Mr. Chairman—is that American progress in energy efficiency has stagnated.

The New York Times seems to be being called on the carpet here a lot, but they did publish an interesting report that was not based on any leaked data, that was in the paper about two week ago, which said essentially exactly that, that after 12 years of very solid progress in energy efficiency in the United States, last year our energy productivity started to decline for the first time since the Carter Administration.

I believe it was Senator Burns asked the question of why are not these alternative resources coming to the fore? Why is it an academic question?

We would answer that the reason that we are having such trouble developing these alternatives resources is twofold. One, the international price of oil has, to a certain extent, affected the competitiveness of certain kinds of energy efficiency investment.

But more importantly, the U.S. Federal government has dropped the ball. For eight years the national government has failed to exert any leadership toward energy efficiency, has undermined programs devoted to develop energy efficiency, has rolled back automobile fuel efficiency standards, has gutted funding for conservation programs, has stopped productive research.

With that kind of outlook, it is easy to see why a committee charged with the energy development of the United States would become a little desperate in its search for new alternatives.

But frankly, our view is that the productive potential of energy efficiency and of the development of renewable resources is such that it would be a terrible mistake to substitute for those kinds of actions the development of a seemingly attractive new oil field, even if the oil field could be developed without significant environmental damage.

The fact that it is an oil field that lies under what we believe is a unique Arctic ecosystem, and an extremely fragile environment, makes that mistake even more glaring.

I would just point up in finishing up that if we wanted to look at one alternative to developing the oil that is, at a speculative point of view, lies underneath the Arctic coastal plain, we might look at the option of not just stopping to roll back CAFE standards, but of a deliberate effort to increase American automobile efficiency.

Right now the U.S. is not just falling behind our own pace in developing energy efficiency, but we are falling further behind our trading partners.

Japan, for example, was 45 percent more efficient in energy use than we were in 1970. But according to the New York Times article, it increased that gap to 50 percent last year.

If we were to decide that instead of developing the Arctic National Wildlife Refuge for oil and gas resources, we would make a concerted effort to develop fuel efficiency standards for automobiles that made some sense in terms of the economic marketplace, standards like those contained in Senator Wirth's global warming bill, or actually an amendment to the global warming bill last year.

It would have a number of effects. Number one, we could save between five and 15 times as much oil as we can develop in the Arctic coastal plain over the same period of time.

Number two, since 20 percent of the U.S. carbon dioxide emissions come directly out of the tailpipes of light trucks and cars, all other things being equal, it could make a 10 percent dividend, or 10 percent cut, in our national carbon dioxide emissions by this one step alone.

This would be an important first step without which we probably do not have any hope at all of meeting the 20 percent national reduction goal that was agreed to at least year's Toronto conference, and is incorporated in Senator Wirth's goal, as a national goal for the United States.

In closing I would just say that we would urge the Committee to lead the Congress in an effort to construct an energy future which is based on competitiveness, efficiency, and a sense of the new context in which national energy policy must be formed.

We urge the Committee to save the Arctic Wildlife refuge, and to promote an effort at orderly resource development which looks first at least cost methods of attaining energy security and protects the most precious of our natural resources for the future.

[The prepared statement of Mr. Yeager follows:]

National Audubon Society

NATIONAL CAPITAL OFFICE 801 PENNSYLVANIA AVENUE, S.E. WASHINGTON, D.C. 20003 (202) 547-9009

STATEMENT OF BROOKS B. YEAGER

VICE PRESIDENT FOR GOVERNMENT RELATIONS

NATIONAL AUDUBON SOCIETY

REGARDING S.406,

LEGISLATION TO OPEN THE COASTAL PLAIN

OF THE ARCTIC NATIONAL WILDLIFE REFUGE

FOR OIL AND GAS DEVELOPMENT

BEFORE THE SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

HONORABLE J. BENNETT JOHNSTON, CHAIRMAN

MARCH 6, 1989

Mr. Chairman, Members of the Committee,

Thank you for the invitation to testify before you today on the question of whether to open the coastal plain of the Arctic National Wildlife Refuge for the development and exploration of crude oil and natural gas.

The National Audubon Society is a non-profit, national membership organization dedicated to the protection of the environment and of wildlife, and to the conservation and wise use of our natural resources. Audubon is one of the nation's oldest environmental organizations with more than one-half million members and more than 500 active chapters located throughout the United States and in several foreign countries. Audubon members and staff engage in a broad range of scientific and environmental policy studies, research projects, and conservation efforts aimed at improving public understanding and appreciation of wetlands, wildlife habitat, energy and pollution policy issues, and a host of other environmental concerns.

Audubon's policy on the question before you today, reached after extensive discussions by the Board of Directors, is that the coastal plain of the Arctic National Wildlife Refuge should be managed and protected as wilderness unless impartial scientific judgement concludes that 1) the potential oil resources of the coastal plain represent the only method for the nation to meet its energy needs, and 2) the extraction of any oil resources which may underlie the coastal plain can be accomplished without damage to the outstanding wildlife and wilderness resources which the Refuge was created to protect.

These are high criteria, and deliberately so. The unique quality and particular fragility of the wilderness ecosystem which is the Arctic National Wildlife Refuge has been internationally recognized. Arguments for its protection have been made by the International Union for the Conservation of Nature, as well as by the Canadian Government. It has been widely noted that the 100-mile coastal plain of the refuge is the only stretch of Alaska's thousand-mile Arctic coast which is not open to development. The Committee has already heard all this, and more -- that the coastal plain is one of the few, if not the only places, on the North Slope where polar bears den onshore, that it contains the principal calving ground of the Porcupine River caribou herd, that it contains habitat for dozens of other rare Arctic species, from Arctic foxes to muskoxen and peregrine falcons.

In short, the coastal plain of the Arctic National Wildlife Refuge is precisely the kind of resource that a society with a long-range view to its own future would try its utmost to protect, and not to compromise, unless and until its development was the last resource to which that society could turn to maintain the energy security necessary to its basic livelihood.

THE MYTHS OF ARCTIC OIL AND GAS DEVELOPMENT

During the oversight and legislative hearings that were held on this issue last Congress, many myths about oil development in the Arctic were

exploded. I will focus my attention today on the energy policy issues raised by the proposal to develop the coastal plain, so I won't attempt to reargue all the points in detail here. I would, however, like to cite some of the salient issues, and urge those Senators who were not members of the Committee last year to review the testimony which explores them at greater length.

MYTH #1: The development of the oil resources of the Arctic Coastal Plain is necessary, as a matter of national security, to ensure against oil shocks over the next decade.

Actually, the decision of whether or not to develop the coastal plain has very little relevance to any short-term effort to prepare for oil import disruptions or price fluctuations.

Because of the length of time necessary to bring an Arctic field into production, the decision to develop the coastal plain would have little relevance to our oil security over the next decade. Other steps, such as increasing the capacity of the Strategic Petroleum Reserve, could in fact have greater beneficial effects in the short to mid-term.

MYTH #2: The development of the Arctic Coastal Plain is the best step we can take to curb oil import needs over the long-term.

Most of the available evidence seems to point to the presence of significant quantities of in-place oil in strata underneath the coastal plain. However, the amount of these resources, and the quantity which may be commercially available at various price levels, is highly speculative.

The Interior Department's optimistic projections of recoverable resources were based on an assumed oil price of $35 per barrel, in mid-1984 dollars, in the year 2000. These assumptions now seem likely to overestimate the real price at that time, and underestimate, for various reasons, the real cost of developing a producing field. Therefore, even if the Interior Department's geological assessment is correct, its projections of the price-dependent availability of oil may be far off the mark.

In contrast to this welter of ambiguities about the value of the coastal plain's oil and gas resource, there is very little uncertainty that other courses of action available to us will produce oil savings that can far outweigh the coastal plain in their effect on our overall oil picture. For instance, a deliberate investment in greater auto efficiency would produce far larger quantities of oil savings than the expected production of a coastal plain oil field even estimated at the high range of its capacity. I will discuss this issue in more detail in the remainder of my testimony.

MYTH #3: The Coastal Plain is a barren wasteland, not worth the effort to protect.

As discussed briefly in my testimony, a surprising number of people, organizations, and even governments seem to disagree wholeheartedly with this casting of the issue. Perhaps here it is only necessary to cite the Centennial issue of the National Geographic Magazine, which focussed on the coastal plain as a critical and endangered North American and world resource.

MYTH #4: The Prudhoe Bay experience proves that oil and gas development in the Arctic can be achieved without significant damage to wildlife and wildlife habitat. Colloquially known as the "Caribou love pipelines" theory.

Evidence presented to the Committee last Congress cast doubt on this argument from virtually every possible angle. Scientific analysis, some of it from the Fish and Wildlife Service itself, indicated that the much-heralded increase in numbers of the Central Arctic Caribou herd was linked to the local extinction of predators, including wolves and bears. Other scientists expressed doubt that the experience of the Central herd, which is small and largely stationary, had much applicability to the much larger, migratory Arctic herd.

Further evidence showed that the original estimates of wildlife and habitat damage from Prudhoe greatly underestimated the actual effects -- that in fact, for all the care that the oil companies say they have taken, Prudhoe still has many of the severe pollution and waste disposal problems associated with any other large industrial complex. Other evidence was presented that, despite this fact, the Interior Department's final assessments of impacts from the development of the coastal plain were weakened in key respects from the conclusions presented in the draft report.

Other testimony to be presented today will address the issue of whether the development of the Arctic Coastal Plain for the extraction of oil and gas resources can be accomplished without damage to the delicate balance which is the heart of any intact ecosystem, and particularly of this one. Clearly, we think the answer is that, at present and for the foreseeable future, it cannot. There may come a time when the development of technology would allow the extraction of petroleum from a place like the coastal plain without any man or machine ever having to set foot on the surface. At present, however, the evidence leads us to believe that the enactment of development legislation will inevitably lead to the destruction, not only of wildlife and wildlife habitat, but of the essential wilderness balance which is at the heart of this unique Arctic ecosystem.

In that case, what can we say about the need to make such a sacrifice? Is the United States in such dire straits that we should willingly sacrifice our most unique natural values in order to produce energy resources? Are we in a position similar to that of Brazil, whose government feels bound to ignore

international concern over the future of the tropical rainforest, in favor of present domestic political concerns?

THE NEW WORLD OF ENERGY POLICY

As was pointed out from many sides in last year's Committee debate on the Wirth-Bumpers-Evans Amendment, the effort to effect a coherent national energy strategy has suffered eight years of what one can only call malign neglect. I would suggest to the Committee that if that effort were made now, the result and even the very elements of the discussion would be highly different than in the past.

In the past, discussions of our national energy situation inevitably cast our energy future in terms related primarily to the security of our oil supply, and secondarily to the health of various U.S. energy industries, not least the petroleum industry. Energy security in the short term was thought of in terms of the need to avoid price shocks and supply interruptions. Energy security as a long-term concern was thought of, if at all, in terms of milking the last drop of fossil fuels, and finding innovative ways to convert potential fossil fuels, such as oil shale, to a useable form.

These concerns remain important, but in the last few years they have appeared in a much different context. The fact that excess emissions of carbon dioxide to the atmosphere have now reached the point where they represent a threat to the stability of world climate systems has forced a rethinking of traditional energy policies. The fact is, that the world cannot afford to burn all its fossil fuels, or even a very large portion of the remaining inventory, without courting potentially disastrous changes in world climate processes and conditions.

In addition, real and effective steps have been taken to deal with some of the most acute of the last decade's oil security problems. The oil price slide itself is evidence, that through the development of energy efficiency and alternative resources, we won the decade-long struggle with OPEC. In fact, it has been estimated that between 1973 and 1983, the U.S. economy achieved energy productivity gains that currently save us over 13 million barrels of oil per day -- half the entire productive capacity of OPEC. Similarly, between 1975 and 1985, the U.S. auto industry, encouraged by Congressionally mandated Corporate Average Fuel Economy (CAFE) standards, improved the average fuel efficiency of its new car fleet from about 14 mpg. to about 27 mpg., with a resulting increase in the average fuel economy of all American cars and light trucks of about 66%. This step, by itself, now saves us more than 2.4 million barrels of oil per day.

On another front, this Committee has taken a leadership role in improving the resilience of the U.S. economy to any short-term supply interruption, through its insistence on maintaining a high fill-rate for the Strategic Petroleum Reserve. Largely as a result of your leadership in this area, SPR now holds, as I understand it, something on the order of a 100-day supply of oil for U.S. domestic consumption. Although we at the Audubon Society would advocate continued efforts to expand the reserve, I should note for

the Committee the Energy Department's conclusion, in its 1987 Energy Security report, that "The United States is better prepared than ever before to deter, as well as to respond to, any energy supply emergency arising from foreign disruptions." That is not to say that concern over our exposure to the short-term fluctuations of the oil market is no longer warranted. Clearly however, you have already found one of the keys to addressing that problem, and to the extent that such short term fluctuations remain a worry, further efforts to expand SPRO and assure a continued high fill-rate represent the most effective single response.

I do not recite all this in order to give you the impression that our energy difficulties are resolved. Far from it. In fact, there are some extremely disturbing clouds on the horizon. However, oil security is no longer the single focus of our energy concern. And steps that might have reasonably been taken ten or twenty years ago to address our oil security dilemma as perceived at that time may no longer be appropriate to the present situation. Drilling the Arctic Coastal Plain as a solution to America's energy problems is a throwback, not a policy for the '90s.

ENERGY POLICY THROUGH THE REAR-VIEW MIRROR

Last year, Audubon joined the Sierra Club and Friends of the Earth in the publication of a report which analyzed the basis, in national energy policy, for the Reagan Administration's claim that the development of the coastal plain was a necessary step, in fact "the cornerstone," of U.S. energy security for the 21st Century. Perhaps not surprisingly, the report, Wasted Energy, concluded that such a claim was mistaken, based on a misreading of the real energy situation which faces the nation and an unwillingness to take the numerous steps available to constructively grapple with it. As the principal author of the report, I would like to summarize its argument here, and submit it for the Committee's record.

The fundamental conclusion of Wasted Energy is that the drastic decline in U.S. domestic oil production in the last two and a half years is primarily the result of the precipitous plunge in world oil prices during the same period. In other words, the U.S. domestic drilling industry is not, in the short term, running out of oil to extract, or prospects to explore, but is the victim of an international oil market which has rendered much U.S. oil momentarily too expensive to produce.

In the long term, the report concluded, the U.S. must indeed face constraints from the dwindling availability of petroleum resources, as well as from the danger of excessive fossil fuel combustion, but the Reagan Administration energy program, which advocated developing the coastal plain but undermined or neglected energy efficiency and renewable alternatives, appeared to be ill-suited to address this problem.

In fact, the last Administration's proposal to drill the coastal plain while rolling back efficiency standards for automobiles and light trucks is the equivalent of the harried homeowner who, unable to keep enough hot water

in the tub, chooses to turn up the faucet, or even buy a new water heater, before thinking of putting in a cheap rubber stopper.

The report also cited evidence from key oil industry analysts which indicated that, given stable price incentives only moderately higher than current prices, considerable new oil could be produced through infill drilling and the enhanced production of existing reserves, as well as through the accumulation of small to mid-size, "non-glamorous" new resources. Although the pace of resource acquisition had slowed under the influence of the 1986 price crash, the analysts cited in the report generally concluded that a surprisingly large resource -- up to 48 billion barrels, according to William Fisher, the head of the Texas Bureau of Economic Geology -- can be accessed at prices of $25 per barrel and below. Although this is significantly higher than current price levels, it is considerably below the price at which oil from the coastal plain, if found, is expected to be commercially prudent to produce.

The report concluded that the Reagan Administration's call to lease the Arctic Coastal Plain could not be justified as a necessary part of an overall strategy to improve U.S. energy security. Indeed, developing the Arctic seemed to have become a substitute for such a strategy for an Administration which was incapable of facing the many other policy choices which really might make a difference in the long run.

The glaring failure to achieve any coherent strategy for pursuing real energy security is even more obvious in the narrow context of the 1002 Environmental Assessment and Recommendation than it is in the broader context of national energy policy and federal investment strategies generally. The Interior Department's assessment, which was supposed to lay out the argument for its proposed course of action as well as assessing the likely consequences, barely mentioned the numerous potential alternative methods of meeting U.S. energy needs, and failed entirely to evaluate the supposed oil resources of the coastal plain in comparison to the other options available.

MORE RECENT DEVELOPMENTS IN THE U.S. ENERGY PICTURE: NEW RESOURCE OPPORTUNITIES

Since last fall, when Wasted Energy was published, several new developments have emphasized the need to reevaluate our national energy posture. First, a number of promising new discoveries have been made on already leased lands on the North Slope, and the oil industry has predicted a surge of drilling activity during calendar year '89.

One of the most interesting new discoveries appears to be at Point McIntyre, only two miles north of the Prudhoe Bay producing area, but in an entirely separate accumulation. Articles in the industry press and the Washington Post reported that a test well at this location produced at 2500 barrels per day.

This discovery, and the announcements of drilling prospects in various locations including the Colville River area, the Chukchi Sea, and the Beaufort Sea, only serve to emphasize the vast area of Alaska that is already leased, but has not been examined for its oil potential. In fact, an independent oil operator in Alaska, Cliff Burglin, was recently quoted bemoaning the fact that so little of the land leased in the state had been explored. According to Burglin, within the last five years, more than 100 million acres have been offered for lease, onshore and offshore, in Alaska. Of this amount, drilling rights have been purchased on approximately 2 million acres, but fewer than 200,000 acres have actually been tested.

The new exploration trends also raise the question of orderly development of resources, and serve to weaken the oil industry argument that the development of the Coastal Plain is necessary to maintain the TAPS pipeline at full flow capacity. Representatives from both Shell and Texaco have expressed the belief that recently leased tracts in the Chukchi Sea may hold reserves of as much as 5 billion barrels of recoverable oil -- that is, that the Chukchi Sea may represent another "world class" oil deposit. If that is the case, wouldn't a rational development program withhold irrevocable commitments in other, more fragile environments, and instead wait to see the results of exploration and development of already-leased lands?

The question of orderly development is also raised by the existence of explored reserves on the North Slope on which the industry has chosen to delay development until world oil prices make production more attractive. These areas, as I understand it, include the West Sak and Milne Point fields, and perhaps others as well. Again, why wouldn't a rational development policy provide for the development of already explored reserves before turning to speculative resources in more fragile environments?

MORE RECENT DEVELOPMENTS: THE STAGNATION OF NATIONAL PROGRESS IN ENERGY EFFICIENCY

Second, the New York Times reported on February 27 that U.S. progress in energy efficiency has effectively halted, and that, more disturbing, national energy productivity had in fact declined in the first 9 months of 1988, reversing a 12-year trend. The article notes that, abetted by the Reagan Administration's year-by-year rollback of the CAFE standards, the average fuel efficiency of the U.S. new car fleet stopped improving in 1986.

Reflecting on the last Administration's policy in this area, some analysts have despairingly concluded that there has been an effort, in effect, to create the need for Arctic development. In a recent letter in Science, for instance, an analyst from Rocky Mountain Institute observed that the 1986 CAFE rollback was the equivalent of a decision to boost our oil imports by 295,000 barrels of oil per day -- roughly equal to the production potential of the coastal plain's oil resources as estimated by the Interior Department.

Whether it was the result of deliberation or merely incompetence, the fact is that we in the U.S., who have long been lax in the international competition for energy efficiency, have now fallen even farther behind our key trading

partners. Japan, for example, was 44.9% more efficient in energy use than we were in 1970, but, according to the Times, had increased that gap to 49.1% last year.

CONCLUSION

Wasted Energy, the report I previously referred to, discusses at some length the reasons for the stagnation of U.S. energy productivity gains, including the effects of low energy prices, and the overt hostility of the last Administration. I will not pursue the details here. I believe, however, that this disturbing development poses a direct challenge to us, and to this Committee, regarding the kind of energy future we intend to build in the United States and the world.

The proposed development of the coastal plain of the Arctic National Wildlife Refuge for oil and gas is highly controversial, for all of the reasons I have outlined above. We believe it is both unwise and unnecessary.

In contrast, a concerted effort to get the United States back on track to achieve greater energy productivity would pay off in innumerable ways. Just to pick the most pertinent example, since approximately 20% of U.S. CO2 emissions come directly out of the tailpipes of our cars and light trucks, a 10-year program to double light vehicle fuel efficiency, such as that advocated by Senator Wirth and others, would, all things being equal, provide a 10% CO2 reduction "dividend." This is an important first step, without which we probably have little hope of reaching the nation-by-nation 20% reduction goal agreed to at last year's Toronto Conference, and incorporated into Senator Wirth's global warming legislation as a national goal of the United States. At the same time, it would produce oil savings equivalent to over 15 Arctic coastal plains, and it would do so at a per barrel price considerably lower, according to most analysts, than the price at .. .ch coastal plain oil can be competitively extracted.

We urge the Committee to lead the Congress in an effort to construct an energy future which is based on competitiveness, efficiency, and a sense of the new context in which national energy policy must be formed. We urge the Committee to save the Arctic Wildlife Refuge, and to promote an effort at orderly resource development which looks first at least cost methods of attaining energy security, and protects the most precious of our natural resources for the future.

The CHAIRMAN. Thank you very much, Brooks. Next we will hear from Roger Herrera, manager for exploration and lands, British Petroleum Exploration in Anchorage.

STATEMENT OF ROGER C. HERRERA, MANAGER, EXPLORATION AND LANDS, BRITISH PETROLEUM EXPLORATION

Mr. HERRERA. Thank you, Mr. Chairman. It is always very interesting appearing before your Committee. And this time is no exception.

What I would like to do in the time available, if I may, is just bring you up to date with things that have happened, new things which are relevant to any decision you make in this Committee, over the past nine months in the Arctic.

Perhaps in passing, before getting into those points—and I will only make four points, very straightforward and clear ones, but pertinent. Before addressing those, there are a couple of issues which perhaps are worthy of comment.

First of all, this wretched EPA report which we are all talking about. It is an irresponsible way of getting things into the record.

But it so happens that the forerunner of that report, which was a trip report of the visit of the individuals to the North Slope during breakup in June of last year, called the Versar Report, after the name of the company that produced it for EPA, came out sometime late summer last year, and my company was somewhat chagrined by the nature of this report because it perceived it to be a very biased unprofessional piece of work. And so we did a critique of it and gave it to EPA.

At that time EPA assured us that they would take note of our comments, and in due course when they produced a final draft report in-house they would release it to us for further peer review, if you like, or comment before finalizing it. Obviously that process is cut short.

But if you will, Mr. Chairman, I would like to submit the original comments of the original report, which may, I have to admit, be different from the one that is now being leaked, but nevertheless contains similar information for your record.

The CHAIRMAN. Yes, we would appreciate that, and we will staple that together with the draft report.

Mr. HERRERA. The other point I would like to make, since you have been hearing a lot of criticism of what has happened at Prudhoe Bay historically, is you do not hear much about Endicott.

And that is rather interesting, because as you well know Endicott represents the state of technology of operating in the Arctic. And the fact that nobody mentions it suggests that it is working well. And if you really want to see how ANWR might be operated in the future, that is the oil field that you should be concentrating on.

Because all the experience which we learned at Prudhoe Bay was put into that field. And the many mistakes which were reasonably made at Prudhoe Bay were corrected at Endicott.

Now, let me get to my four points. The changes——

The CHAIRMAN. By the way, Endicott is how many acres?

Mr. HERRERA. Endicott is 55 acres. And if you include the approach road to it, and the pipeline road to it, it is about 146 acres of land, which has been disturbed, if you will, to produce 100,000 barrels of oil a day from—Senator Murkowski said the ninth largest oil field in the United States of America.

So the footprint of that is miniscule compared with other examples, earlier examples of technological development in the Arctic.

My four points, Mr. Chairman, which are new items, which you probably are not aware of in your last year's record, are as follows.

First of all, a major one is in waste handling. The perception that reserve pits were nasty things, and sometimes there was a basis for that perception, has been corrected. Basically rather than just comply with new regulations, which the state of Alaska put into effect in late 1987, which themselves were designed to correct any perceived problems with reserve pits, we decided to eliminate the problem.

And last summer, at the expense of about $20 million, all of the reserve pits on the west side of the field were physically emptied up there, liquid contents. Consequently, there is no liquid in the pit, none can leach out to damage the environment.

Furthermore, we took one other step. We did a bioaccumulation study, the first one which has really ever been done on the North Slope of Alaska, adjacent to pits and obviously using control areas as well for comparison, to see if anything which had leached out of those pits over the last 10 or 15 years had accumulated in the plant and animal life, and was a problem in the biological food cycle.

Now, the result of that report—I hasten to add is in draft form—it has now been submitted to the state and federal agencies for peer review. And rather than perpetuate this nastiness of putting draft reports into the record I would prefer that it becomes finalized in due course in a responsible fashion.

But in praising the draft results at least one can say with certainty that the bioaccumulation study found no accumulation of heavy metals in any of the food chains at all.

And in fact the only adverse effect that it did ascertain was salt kill adjacent to some of the pits which have historically leaked, salt kill of vegetation.

One of the interesting aspects of that study, of course, it was studying things of the past, because no longer will we have that situation, not only because we have emptied the reserve pits but also we have gone the next stage of technological development with regard to handling of mud and cuttings in Prudhoe's waters.

The P pad, which is a brand new pad in Prudhoe Bay, the Prudhoe Bay field, which is built to trap a small portion of the field which was geologically difficult and therefore left to loss, does not have a reserve pit of any kind. We have done away with the reserve pit. That is the latest technology, if you like.

Basically, at that location, we grind up the mud and cuttings in a ball mill into a slurry, and then inject the resulting mud slurry, if you will, down into an approved formation beneath the permafrost.

Therefore, you do not need reserve pitch, you do not have problems with things leaching out of reserve pits, and it is a nice, acceptable solution to that perceived difficulty, which has been generated over historical time.

Other things which have happened since last year, the anadromous fish studies, the studies of these Arctic Cisco and Lees Cisco which were talked about earlier, have now reached a point where all the information is to be published.

The University of Alaska published a huge tome of biological papers on the physical and biological conditions in the new shore area of the Beaufort Sea. This is a great advancement in pure scientific knowledge, and what it shows, Mr. Chairman, is that the Lees Cisco and the Arctic Cisco, which are the two species of greatest concern, have increased their populations in the Beaufort Sea since the west stock causeway was built in 1981.

And all measurements to ascertain the health of those populations, the weight of the fish at a given age, their length, how fat they are, and so on, indicate no difference from pre-causeway measurements, measuring the same factors.

So there is absolutely no biological evidence of any adverse impact on those fish populations as a result of the two causeways which have been constructed off shore.

This is pertinent to ANWR because, if only as a dock, probably a gravel causeway of some kind, out to a sufficient water depth, would be required to develop ANWR in the most economic and efficient fashion.

Air pollutants have been a concern of Prudhoe Bay. We are now monitoring air emissions 24 hours a day, 365 days of a year. And that information is publicly available.

More importantly, though, we have decided, because again of accusations that the small amount of NOX, which is the major pollutant from the burning of natural gas in the turbines at Prudhoe Bay, is affecting the tundra, to carry out probably a five-year or longer study of just what the implications on the biology of the area are from air pollutants.

This study is being done by Boyds-Thompson Institute, which I believe is attached to the University of Cornell. It will, as I say, be a long-term study. They are the world's experts in the effect of pollutants on vegetation, and presumably that should give us a definitive answer to the suggestions that there are adverse effects from NOX emissions in Prudhoe Bay, and in the Arctic generally.

Things like the caribou studies and bird studies have been ongoing. Interestingly enough, the caribou, yet again, did not calf, the Porcupine caribou, this in the Jago Islands so-called core calving area.

If we look at the record now, and it is incomplete unfortunately, because we do not have the Department of Interior's hard records since 1985—for some reason they have not yet published those—but one can say with a degree of certainty that since 1982, the maximum of any one year, and only one year has this happened, of utilization of that so-called core calving area, has been 25 percent of the pregnant cows. In every other year, since 1982, the percentage has been less than 13 percent, and mostly in single figures.

The CHAIRMAN. They go down to Canada?

Mr. HERRERA. That is correct. Or outside of the coastal plain.

Further, to these improvements, or new knowledge of biological and physical systems, we have also undertaken a major new research effort which the University of Alaska is doing on our behalf,

and this will probably be a 10-year study, to ascertain the best way of rehabilitating gravel structures.

Now, as you are aware, a lot of work has been done on this, specifically in the old naval petroleum reserve by the U.S. government, and that has been well publicized.

However, we have never had to rehabilitate structures in Prudhoe Bay. We have never abandoned structures. But obviously this is a concern. And therefore this 10-year study on what we should do with gravel pads and roads to best revert them back to useful habitat will undoubtedly come out of this study.

I think the fact that this problem is being approached in a logical scientific fashion should give us a logical scientific answer which will assure us all that we can rehabilitate the coastal plain, if development ever takes place.

My last two points, Mr. Chairman, of changes since last year are the ones which you are well aware of. First of all, there has been reduced exploration in this country. We have reduced production in this country.

Interestingly enough, a fact which is not often realized is that when we add to our reserves in any one year—for example last year in 1988, four-fifths of the new oil that we added to those reserves came from existing oil fields.

In essence, what we were saying is that we can now push an extra one percent out of this field, and therefore we add that one percent to our reserves, or we are going to infill drill in a more scientific fashion rather than just doing grid infill drilling, and find a little more oil that way.

But it was oil which we knew about before. Only one-fifth of our reserves last year were new discoveries. You cannot keep on relying on old fields, dragging more oil out of them. Obviously, that is a diminishing effort. We have got to find new oil, which of course brings ANWR into a different perspective.

At the same time that we are having these problems of finding new oil in this country and our diminishing production, diminishing reserves, we are increasing our imports. That is the fourth change since last year, which should not be underestimated.

Basically, the world supplies of oil have gone up dramatically. We now have almost a trillion barrels of oil in the world which are producible under today's technological and economic conditions, the largest supply of oil the world has ever known.

Unfortunately, nearly all of it resides in the Middle Eastern countries and Russia. Very little of it resides in the United States of America.

Basically, we cannot conserve our way of this situation. And the parallel to illustrate that, and perhaps refute some of the arguments that we often hear, is there on the North Slope of Alaska.

In 1973, when the decision was made to build the TAPS pipeline, which subsequently led to the development of Prudhoe Bay, since that time the efficiency of passenger vehicles in this country has effectively saved about 2.3 million barrels of oil a day, which is just about the same as North Slope production since that time, 2.2 million barrels at the present time.

Therefore, one can argue we really did not need to produce Prudhoe Bay in 1973, because we had the ability to conserve our way

out of that field, just the same argument as is now being used for ANWR.

I would suggest to you, Mr. Chairman, that if we had not produced Prudhoe Bay because of that argument, we would be in a pretty sick situation today. The value of that field, I will not elaborate it, it is obvious to all of us. But it is very considerable as a national asset.

Mr. Chairman, one last point and then I will stop. That is, about your bill. Obviously, I think the bill is responsible because it takes note of our need for future energy in this country, at the same time taking note of our responsibility to protect the environment.

However, it should, to the extent compatible with protecting the environment, ensure to the greatest extent possible that oil is discovered in the coastal plain.

I think the bill would be enhanced in that regard if the first lease sale contained more than 300,000 acres, as proposed in the bill.

In my written testimony, I have put forward the argument of why that should be. It is basically because geologists are not very good oil finders, and they have to rely a little on luck. But that is a fact of life.

And if you increase the number of acres in that first lease sale, you are more likely to find commercial production at the end of the exercise. So, I would suggest that the bill could be improved in that fashion.

[The prepared statement of Mr. Herrera follows:]

REVISED

TESTIMONY OF

ROGER C. HERRERA
BP EXPLORATION (ALASKA)

BEFORE THE

SENATE ENERGY AND NATURAL RESOURCES COMMITTEE

MARCH 6, 1989

MR. CHAIRMAN, MEMBERS OF THE COMMITTEE...

MY NAME IS ROGER HERRERA. I AM A RESIDENT OF ANCHORAGE, ALASKA, AND WORK FOR BP EXPLORATION (ALASKA). SEVENTEEN YEARS OF MY CAREER IN THE OIL INDUSTRY HAVE BEEN SPENT EXPLORING FOR OIL IN THE CANADIAN AND ALASKA ARCTIC.

I APPRECIATE THIS OPPORTUNITY OF ADDRESSING YOU, ONCE AGAIN, ON THE SUBJECT OF THE COASTAL PLAIN OF THE ARCTIC NATIONAL WILDLIFE REFUGE.

LAST YEAR YOUR COMMITTEE RECEIVED AND CONSIDERED A HUGE AMOUNT OF INFORMATION ON NORTH SLOPE OIL DEVELOPMENT, MUCH OF WHICH IS STILL RELEVANT. RATHER THAN REPEAT ARGUMENTS AND POINTS WHICH ARE VERY FAMILIAR TO YOU, I WILL RESTRICT MY REMARKS TO A FEW COMMENTS ON THE BILL, S. 406, AND SOME REMARKS ON NEW TECHNOLOGICAL AND BIOLOGICAL ADVANCES MADE IN THE PAST MONTHS WHICH HAVE INCREASED OUR KNOWLEDGE AND ABILITY TO WORK IN THE AREA.

IT IS PERHAPS RELEVANT TO MENTION THAT THE 1002 REPORT REMAINS A USEFUL REFERENCE AND SUMMATION OF THE ISSUE AND, WITH ITS APPENDICES, SHOULD BE RETAINED.

S. 406 CLEARLY RECOGNIZES A FUTURE NEED FOR THE SUBSTANTIAL QUANTITIES OF OIL AND GAS WHICH CAN REASONABLY BE EXPECTED TO BE PRODUCED FROM BENEATH

THE COASTAL PLAIN. IT ALSO PLACES GREAT EMPHASIS ON PROTECTION OF THE ENVIRONMENT. AS SUCH, THIS BILL IS RESPONSIBLE AND SHOULD BE SUPPORTED.

I DO NOT THINK THAT THE BILL'S PROPOSED PHASED LEASING IN INCREMENTS OF 300,000 ACRES WILL PRODUCE MAXIMUM REVENUES TO THE FEDERAL GOVERNMENT OR MAXIMIZE THE CHANCES OF SUCCESS OF THE EXPLORATION DRILLING PHASE. AT THE SAME TIME, PHASED LEASING WILL NOT HAVE ANY EFFECT, EITHER POSITIVE OR NEGATIVE, ON ENVIRONMENTAL PROTECTION. WHILE IT MAY HAVE POLITICAL ACCEPTABILITY, IT DOES NOT OTHERWISE IMPROVE THE BILL. AT THE LEAST, THE AREAS FOR SALE SHOULD BE INCREASED TO 500,000 ACRES. THIS LARGER AREA IS ESPECIALLY IMPORTANT FOR THE FIRST LEASE SALE. IT WILL INCREASE THE NUMBER OF INITIAL GEOLOGICAL TARGETS AVAILABLE FOR DRILLING AND THEREFORE THE CHANCES OF SUCCESS. IT IS UNFORTUNATELY TRUE THAT GEOLOGISTS ARE NOT ALWAYS RIGHT IN THEIR SELECTION OF DRILLING LOCATIONS; THEREFORE, THE MORE THEY CHOOSE, THE MORE LIKELY THEY ARE TO BE CHOOSING ONE CORRECT PROSPECT. THESE ARE TOO MANY EXAMPLES FROM AROUND THE WORLD OF GEOLOGICAL BASINS WITH GOOD OIL PROSPECTS WHICH FAILED TO YIELD A DISCOVERY DURING INITIAL DRILLING. ONLY SUBSEQUENTLY, SOMETIMES MANY YEARS LATER, WAS OIL DISCOVERED. IF THAT SCENARIO WAS FOLLOWED ON THE ANWR COASTAL PLAIN AND THE SMALL, INITIAL LEASED AREA WAS DISAPPOINTING, IT IS POSSIBLE THAT EXPLORATION WOULD NOT BE PURSUED TO A SUCCESSFUL CONCLUSION.

AMONG THE TECHNOLOGICAL AND BIOLOGICAL ADVANCES MADE IN RECENT MONTHS HAS BEEN CONSIDERABLE PROGRESS TOWARDS MINIMIZATION OF WASTE MATERIALS AND BETTER TECHNIQUES FOR DEALING WITH MUDS AND CUTTINGS ASSOCIATED WITH

EXPLORATION AND DEVELOPMENT DRILLING. A NEW DRILLING PAD IN THE WEST END OF THE PRUDHOE BAY FIELD, "P PAD", HAS RECENTLY BEEN CONSTRUCTED AND IS OPERATING WITHOUT A RESERVE PIT OF ANY KIND. AS YOU ARE AWARE, NEW AND BETTER STATE REGULATIONS WERE FORMULATED IN 1987 TO ACHIEVE MAXIMUM ENVIRONMENTAL PROTECTION ADJACENT TO RESERVE PITS. THOSE NEW STANDARDS ARE NOW BEING CONSISTENTLY MET. IN ORDER TO ELIMINATE EVEN THE POSSIBILITY OF A PROBLEM WITH RESERVE PITS, ALL THE PITS OPERATED BY BP EXPLORATION WERE TOTALLY EMPTIED OF THEIR LIQUID CONTENTS LAST SUMMER. THIS EXERCISE COST $20 MILLION, BUT IF THERE IS NOTHING IN THE PIT, NOTHING CAN LEAK OUT. FURTHERMORE, WE ALSO MONITOR THE ADJACENT TUNDRA AS REQUIRED BY THE NEW STATE REGULATIONS AND WE HAVE JUST COMPLETED A BIOACCUMULATION STUDY ON THE TUNDRA PLANTS AND ANIMALS TO ASCERTAIN WHETHER PREVIOUS TUNDRA SEEPAGES HAVE ADVERSELY IMPACTED THE LOCAL BIOLOGY. THAT DRAFT REPORT HAS BEEN SUBMITTED TO STATE AND FEDERAL AGENCIES FOR THEIR COMMENTS PRIOR TO FINALIZATION. IN ESSENCE, IT SHOWED NO EVIDENCE OF BIOACCUMULATION OF ANY HEAVY METALS OF CONCERN BEYOND BACKGROUND LEVELS. MICROINVERTERBRATES, WHICH ARE CRUCIAL TO THE FOOD CHAIN, HAD NOT BEEN AFFECTED AND THE ONLY DETRIMENTAL IMPACT RECOGNIZED WAS SALT DAMAGE TO SMALL AREAS OF VEGETATION IMMEDIATELY ADJACENT TO SOME PITS. FUNDAMENTALLY, THIS STUDY WAS EVALUATING PAST PRACTICES BECAUSE IT IS UNLIKELY THAT SEEPAGE FROM RESERVE PITS WILL BE A FACTOR IN THE FUTURE.

"P PAD", WHICH I MENTIONED, IS UTILIZING A TECHNIQUE OF GRINDING UP THE DRILLED ROCK CUTTINGS AND MUD INTO A FINE SLURRY WHICH IS THEN INJECTED INTO AN APPROVED RESERVOIR DEEP BENEATH THE PERMAFROST. FURTHERMORE, WE ARE NOW USING EQUIPMENT WHICH ENABLES US TO CLEAN AND RECIRCULATE THE

DRILLING MUD MANY MORE TIMES THAN PREVIOUSLY POSSIBLE. OVER MANY DECADES, CONVENTIONAL RESERVE PITS HAVE BEEN PRACTICAL AND SAFE STRUCTURES BUT THE ISSUES RAISED BY THEIR USE IN THE ARCTIC ARE NOW ELIMINATED. INDUSTRY IS PRESENTLY STUDYING THE BEST METHODS OF CLOSING AND REHABILITATING MANY EXISTING PITS SO THEY ARE NO LONGER A RESERVOIR FOR SNOW MELT.

THESE STEPS TYPIFY THE EVOLUTION OF KNOWLEDGE AND TECHNIQUE AIMED AT CONTINUALLY ENHANCING ENVIRONMENTAL PROTECTION IN ARCTIC OPERATIONS.

OTHER WASTES ASSOCIATED WITH THE OIL FIELD, INCLUDING SMALL QUANTITIES OF HAZARDOUS WASTES, ARE BEING MANAGED BY MINIMIZING THEM AND TREATING THEM FOR REUSE AND RECYCLING OR TRANSPORT TO AN APPROVED SITE OUTSIDE THE STATE OF ALASKA. THE NEED FOR A STATE-OF-THE-ART NORTH SLOPE WASTE MANAGEMENT FACILITY OPEN TO ALL RESIDENTS AND OPERATORS HAS BECOME OBVIOUS WITH THE FILLING OF THE NORTH SLOPE BOROUGH FACILITY. THE OPERATING OIL COMPANIES HAVE CONTRACTED AN ENGINEERING FIRM, ENSR, FOR A FEASIBILITY EVALUATION OF SUCH A FACILITY. THAT STUDY SHOULD BE COMPLETE BY MID-YEAR AND SHOULD BE FOLLOWED BY PERMIT APPLICATIONS AND CONSTRUCTION. THE FACILITY WILL NOT DEAL WITH HAZARDOUS WASTES OTHER THAN FOR STORAGE AND ONWARD TRANSPORTATION. THERE ARE TOO FEW HAZARDOUS WASTES TO JUSTIFY TREATING THEM. IT WILL ALSO EXCLUDE MUDS AND CUTTINGS AND PRODUCED WATER WHICH CAN BE DEALT WITH BY METHODS I HAVE PARTIALLY DESCRIBED, BUT ALL OTHER WASTES WILL BE HANDLED.

THE QUESTION OF REHABILITATION OF GRAVEL PADS AND ROADS IS NOT A NEW ONE AND A GREAT DEAL OF RESTORATION WORK HAS BEEN DONE AND REPORTED ON,

ESPECIALLY BY THE FEDERAL GOVERNMENT IN THE NATIONAL PETROLEUM RESERVE, ALASKA. HOWEVER, LARGE SCALE RESTORATION HAS NEVER BEEN ATTEMPTED AND TECHNIQUES ARE GENERALLY UNPROVEN. CONSEQUENTLY, A RESEARCH PLAN TO DEAL WITH ABANDONED GRAVEL STRUCTURES HAS BEEN PREPARED AND SUBMITTED TO STATE AND FEDERAL AGENCIES FOR COMMENTS. THIS WILL BE A LONG RANGE PLAN AIMED AT ESTABLISHING THE BEST METHODS TO REHABILITATE UNVEGETATED GRAVEL STRUCTURES TO MAKE THEM VIABLE NEW HABITATS. IN ASSOCIATION WITH THIS PLAN AND RESEARCH, WE ARE ABOUT TO SUBMIT TO THE STATE OF ALASKA A PLAN TO IMPROVE THE 70+ ABANDONED EXPLORATION WELL SITES SCATTERED ACROSS THE NORTH SLOPE. THE OUTCOME OF THIS WORK CAN BE CONFIDENTLY FORECAST TO PRODUCE TECHNIQUES WHICH WILL ENABLE RESTORATION OF THE COASTAL PLAIN OF ANWR TO BE ACHIEVED IN AN AESTHETICALLY AND BIOLOGICALLY FAVORABLE FASHION IN THE AFTERMATH OF OIL AND GAS PRODUCTION FROM THAT AREA.

WITH REGARD TO CLEAN AIR STANDARDS ON THE NORTH SLOPE, EMISSIONS ARE NOW CONTINUALLY RECORDED AT PRUDHOE BAY SO MONITORING MEASUREMENTS ARE ALWAYS AVAILABLE. THERE IS NO EVIDENCE THAT THE EPA PRIMARY STANDARD FOR NOX (THE MAIN POLLUTANT) IS INADEQUATE TO PROTECT THE BIOLOGY OF THE AREA, AND WE KNOW IT DOES NOT CONTRIBUTE TO ACID RAIN DEPOSITION IN THOSE REGIONS OF THE CONTINENT WHERE IT IS A PROBLEM. HOWEVER, BECAUSE OF CONCERNS OF THEORETICAL EFFECTS OF NOX, BP EXPLORATION AND ARCO HAVE INITIATED A STUDY TO EVALUATE THE POTENTIAL IMPACT OF NOX EMISSIONS ON VEGETATION. THE BOYCE THOMPSON INSTITUTE, ASSOCIATED WITH CORNELL UNIVERSITY, WILL CARRY OUT THE WORK. THEY ARE THE WORLD'S EXPERTS ON AIR QUALITY IMPACTS ON VEGETATION AND ARE AN INDEPENDENT GROUP. THIS WORK MAY TAKE FIVE YEARS, BUT IT WILL SIGNIFICANTLY ENHANCE OUR UNDERSTANDING OF ARCTIC SYSTEMS.

OTHER ONGOING BIOLOGICAL WORK WHICH IS DIRECTLY APPLICABLE TO ANWR INCLUDES CONTINUING FISH STUDIES IN THE BEAUFORT SEA. OVER $25 MILLION DOLLARS HAS BEEN SPENT IN THE PAST EIGHT YEARS MONITORING FISH POPULATIONS AND THE RECENT PUBLICATION BY THE UNIVERSITY OF ALASKA OF MANY SCIENTIFIC PAPERS ON THIS WORK HAS ADDED IMMEASURABLY TO THE KNOWLEDGE OF THE NEAR SHORE HABITAT AND ITS USE BY ANADROMOUS FISH. SIMILARLY NUMEROUS BIRD STUDIES, INCLUDING THE LONG-RANGE STUDY OF THE HOWE ISLAND SNOW GOOSE COLONY, HAVE CONTINUED IN THE PAST NINE MONTHS ACROSS THE NORTH SLOPE. CARIBOU AND OTHER MAMMALS HAVE ALSO RECEIVED CONSIDERABLE ATTENTION AND ONCE AGAIN, LAST SUMMER, ONLY A RELATIVELY SMALL PROPORTION OF PREGNANT COWS OF THE PORCUPINE CARIBOU HERD AVAILED THEMSELVES OF THE JAGO HIGHLANDS, SO-CALLED "CORE CALVING AREA," WITHIN ANWR. UNFORTUNATELY, U.S. FISH WILDLIFE SERVICE HAS NOT PUBLISHED DATA ON THEIR ANNUAL STUDIES OF CALVING SINCE 1985; CONSEQUENTLY, IT IS NOT POSSIBLE TO GIVE YOU ACCURATE FIGURES OF PERCENTAGE USE OF THE VARIOUS CALVING AREAS.

SOMETIMES DURING THE DEBATE ON ANWR, ONE ASKS ONESELF WHAT WOULD HAVE HAPPENED TO AMERICA IF THE TRANS ALASKA PIPELINE (TAPS) HAD NOT BEEN APPROVED IN 1973. THE NORTH SLOPE NOW PRODUCES MORE THAN A QUARTER OF OUR DOMESTIC OIL -- ABOUT 2.2 MILLION BARRELS OF OIL PER DAY. INTERESTINGLY ENOUGH, THAT IS ABOUT THE SAME AMOUNT OF OIL WHICH WE HAVE SAVED BY INCREASING THE EFFICIENCY OF U.S. PASSENGER VEHICLES SINCE 1973. AT THAT TIME THEY ACHIEVED A FUEL ECONOMY OF ABOUT 13 MILES PER GALLON, WHICH BY 1987 HAD INCREASED TO 17.6 MILES PER GALLON. THAT CONSERVATION REPRESENTED ABOUT 2.3 MILLION BARRELS PER DAY SAVING. THIS REAL EXAMPLE PUTS INTO PERSPECTIVE THE OFT-QUOTED ARGUMENT THAT WE MERELY HAVE TO INCREASE FURTHER

THE EFFICIENCY OF MOTOR VEHICLES TO NULLIFY NEED FOR OIL FROM ANWR. OBVIOUSLY, WE NEED GREATER CONSERVATION AND ANWR OIL JUST AS WE HAVE NEEDED PRUDHOE OIL.

THE BENEFITS FROM PRUDHOE HAVE BEEN INCALCULABLE, BUT IN GROSS DOLLAR TERMS, THE U.S. ECONOMY HAS RECEIVED OVER $100 BILLION FROM NORTH SLOPE OIL. THAT MONEY AND OIL HAS GENERATED MILLIONS OF JOBS ACROSS THE UNITED STATES AND HAS ENHANCED OUR NATIONAL SECURITY DURING A PERIOD WHEN THE IMPORTATION OF AN EXTRA 2 MILLION BARRELS OF OIL A DAY INTO THE U.S. FROM THE MIDDLE EAST MAY HAVE TRIGGERED DRAMATIC CONSEQUENCES. EQUALLY IMPORTANT IS THE FACT THAT THE $100 BILLION WAS NOT LOST TO THE ECONOMY BY BEING USED TO PAY FOR IMPORTED OIL. OUR BALANCE OF PAYMENTS DEFICIT WOULD LOOK CONSIDERABLY SICKER THAN IT DOES TODAY IF THAT HAD HAPPENED.

OTHER POSITIVE SPIN OFFS HAVE BEEN OVER $100 MILLION SPENT ON ARCTIC RESEARCH, MAKING THE NORTH SLOPE ONE OF THE MOST-STUDIED AND BEST UNDERSTOOD ECOSYSTEMS ON EARTH. FURTHERMORE, BECAUSE OF PRUDHOE BAY DEVELOPMENT TENS OF THOUSANDS OF PEOPLE HAVE VISITED THE NORTH SLOPE AND SEEN AND ENJOYED THE ARCTIC IN SUMMER AND WINTER TIME, WHO OTHERWISE WOULD NEVER HAVE EXPERIENCED THAT CLIMATE AND LANDSCAPE. COMPARE THAT BENEFIT TO THE TWO OR THREE HUNDRED VISITORS A YEAR WHO CAN AFFORD TO SEE THE ANWR COASTAL AREA, OR EVEN FEWER THAT ENJOY THE WILDLIFE AND SCENERY OF THE BROOKS RANGE, FOOTHILLS AND TUNDRA PLAINS TO THE WEST. COMPARE ALSO THE WILDLIFE POPULATIONS OF THE DEVELOPED AND UNDRILLED AREAS ON THE NORTH SLOPE. IT IS DIFFICULT TO RECOGNIZE ANY IMPACTS ON ANIMALS TO DISTINGUISH

BIOLOGICALLY WHICH AREA IS WHICH. POPULATIONS IN ALL REGIONS ARE STABLE OR INCREASING AND APPARENTLY HEALTHY.

IT IS REASONABLE TO CONCLUDE THAT THE IMPACTS TO THE NATION OF OIL DEVELOPMENT IN THE ARCTIC HAVE BEEN OVERWHELMINGLY POSITIVE. SIMILAR BENEFITS CAN BE EXPECTED FROM THE COASTAL PLAIN OF ANWR WITH CONSIDERABLY FEWER ENVIRONMENTAL RISKS COMPARED WITH THOSE THAT HAVE OCCURRED AT PRUDHOE. PRUDHOE HAS BEEN A LEARNING EXPERIENCE. WE AS A NATION CAN NOW CAPITALIZE ON THAT EXPERIENCE BY ENJOYING BOTH BIOLOGICAL AND ECONOMIC BENEFITS FROM RESPONSIBLE OIL DEVELOPMENT ON THE COASTAL PLAIN OF THE ARCTIC NATIONAL WILDLIFE REFUGE.

The CHAIRMAN. What figure do you suggest?

Mr. HERRERA. Well, I recognize, Mr. Chairman, the political reality of not leasing the whole area all at once, although ideally that is what should be done, simply because we do not have a sufficiently accurate handle on the geology.

However, given the requirement of having phased leases, I would suggest that that figure should be up to at least 500,000 acres for the initial lease sale.

Mr. Chairman, those are my main points. I made some other minor points in my written testimony, which I hope will be submitted for the record. Thank you.

The CHAIRMAN. Yes. Thank you very much.

Senator WIRTH. Mr. Chairman, before we go on to the final witness, might I just say to these witnesses, thank you very much for being here.

Senator Nunn just sent me a notice to come over and take over the floor on the wonderful Senator Tower debate. And so I thank you all very much for being here, and I am sure the record will be left open for any questions any of us may have.

The CHAIRMAN. Absolutely. Thank you, Senator Wirth. Finally, we have Larry Morse, field manager for Prudhoe Bay Lisburne Operation from ARCO.

Mr. Morse?

STATEMENT OF LARRY MORSE, MANAGER, PRUDHOE BAY FIELD OPERATIONS, ARCO ALASKA, INC.

Mr. MORSE. Mr. Chairman and Members of the Committee, thank you. It is my pleasure to be here today to express ARCO's view on S. 406.

I will summarize my written testimony, and try to touch on a number of topics that the Committee has expressed some interest in.

First, I would like to make a few brief remarks about the need for the legislation now, and then I am going to describe a few of the recent examples of improvements in technology and operations on the slope, review some of our recent environmental study results, and then offer some comments on the bill itself.

As production from the North Slope starts declining, the total domestic production will continue, and if not accelerate, its decline. It has already been stated that the Arctic oil exploration development takes time, as much as 10 years or more from the lease sale to the refinery.

We know that the opening of the 1002 area is a difficult decision for Congress to make at this time, but it is a wise and prudent decision, and one which stands on an intelligent assessment of the future.

As I go along I will highlight some of the specific issues about which the Committee has indicated a desire for additional information, and those include water and gravel supply, waste disposal and effects on animals including caribou.

After the exploration has been performed, using ice roads and paths, gravel sources will be located and developed. And gravel can be obtained from a number of locations. The technique currently

recommended by resource agencies is the creation of gravel pits or mines adjacent to streams.

After the mines are depleted of the gravel, they would be flooded with water, creating a scarce fish over-wintering and waterfowl habitat. Again, this is an existing practice at Prudhoe Bay.

It is important to note that this valuable improvement in habitat, actually a creation of new habitat, might be precluded by section 402 of the bill, which requires reclamation and restoration to original condition.

Based on our experience in the North Slope, less than one percent of the surface area within any 1002 development area would be covered by or excavated for gravel. A map is included in the front of the notebook furnished to you that shows the impacted area versus the total area.

Water for the camp and drilling operations could be taken from a number of sources. They include flooded gravel pits, deepened lakes, melted snow accumulated by snow fences, or if necessary from a seawater desalination plant, or after treatment from water source below the permafrost.

The wells would be directionally drilled from compact drill sites. Again, this technique has evolved considerably in the course of North Slope oil field development. Directional drilling improvements have allowed greater distances to be reached from a central location.

The surface well spacings, that is the distance between wells, has narrowed to 25 feet or less, making much smaller paths and therefore less gravel on the tundra.

Refinements in waste handling have been made, and will undoubtedly be applicable to ANWR development. Drilling waste handling and control has evolved since the early development at Prudhoe.

Now the reserve pits are used only for the solids, principally the cuttings removed from the hole, and mud solids, which are mostly bay rot and naturally occurring clay, such as bentonite, which are used in the mud systems.

We have also recently pioneered another way to dispose of well cuttings and mud solids. At several Prudhoe Bay locations, we have permitted and built eight-foot-in-diameter, 125-foot-deep augered holes to dispose of this material.

These vertical reserve pits, if you will, are filled to within 10 foot or so of the top with cuttings, and some of the soil that was originally augered out of the hole are placed on top of the cuttings to bring the hole back up to grade level.

The remainder of the original material that was augered out of the hole can then be used for construction purposes in the field.

Again, the wastes are permanently frozen and contained in the permafrost, and we are currently evaluating the practicability of this technique to use more widely on the North Slope.

We and our North Slope partners are also looking at several other methods to recycle and improve the handling of drilling waste.

We have moved to the use of mud systems which are environmentally benign, guided by EPA-specific lists of mud constituents

which the agency allows to be disposed of into the ocean without treatment.

Eliminating any question of mud constituents may allow us to greatly reduce by recycling the volumes of muds and cuttings which must be discarded in reserve pits.

For example, we are looking at the possibility that gravel and sand cuttings from the top few thousand feet of each drilled well, called the surface hole, can be used in the field for construction purposes rather than being placed in reserve pits. Since the surface hole is in volume about 50 percent of the total cuttings, this would greatly reduce the waste.

Waste recycling and reuse has long been the way that we handled hydrocarbons that we use in the field. We put all hydrocarbons that can be recycled back into the oil system. Non-hazardous materials, which are incompatible with the refining process and cannot be recycled, are injected into disposal wells on the North Slope. Hazardous wastes are shipped outside of the state to approved disposal sites.

While we are talking about environmental issues, let me review some of our recent findings of our ongoing studies over North Slope fields that may be relevant to the 1002 area.

First, our caribou and our bird monitoring studies continue to strengthen our confidence that the effects of development on these species will be minimal.

As you know, the Central Arctic Caribou herd, which migrates into our existing North Slope fields, has steadily increased in size. This past summer we had a quite large aggregation of animals in the field, some 6,000 to 7,000 animals. They moved freely through the field, the roads, pads, pipelines and facilities did not impede their movement.

Our bird monitoring studies continue to confirm that the birds are not being stressed, disturbed, or moved out of existing oil field areas.

Their density, nesting, and brood-rearing patterns are comparable to similar North Slope habitat distant from the oil fields.

Taken as a whole, our studies have not shown any animal, bird, or fish populations that have suffered significant adverse effects as a result of existing development.

We have clearly changed some habitat, and that is inevitable. And it will be inevitable in the 1002 area as well.

But by careful avoidance of critical habitat areas, and by taking steps to minimize the potential adverse effects, we believe existing oil field development has been environmentally prudent and we believe we can improve on that history in the 1002 area.

Our comment on the bill itself, the section 402, which is the standard to govern land reclamation, requires the reclamation and restoration of disturbed lands to condition as closely approximating the original condition of such lands as is feasible using the best commercially-available technology.

As indicated in the testimony, we believe that this mandate is unwise, since it would preclude restoration methods which will add new habitat, or creatively adapt changed lands to different but valuable uses.

The goal should be one of returning the lands to productive capacity as habitat, or to such other uses as are determined by the secretary at that time to be appropriate. We therefore recommend that this section be deleted, or that the secretary be given discretion to set restoration and rehabilitation standards when development uses have ceased.

The CHAIRMAN. Let me interrupt you at that point and ask for the comments of the state of Alaska on that question.

Ms. MORAN. Mr. Chairman——

The CHAIRMAN. If you do not have them, if you would like to check——

Ms. MORAN. I can submit them for the record.

With respect to ARCO's comments on sand and gravel rehabilitation at those sites, our fish and game department agrees with what ARCO has said, that in many cases this is providing new habitat. And so those sites we would like to see them maintained.

Mr. MORSE. That concludes my comments, Mr. Chairman. And in closing I would like to extend my personal and my company's invitation to you to visit the North Slope.

I hope that any of you that have not had the opportunity to see this vast and remote area will come north this summer. And again, thank you for the opportunity to be here.

[The prepared statement of Mr. Morse follows:]

TESTIMONY OF LARRY MORSE
MANAGER, PRUDHOE BAY FIELD OPERATIONS
ARCO ALASKA, INC.

BEFORE THE COMMITTEE ON ENERGY AND NATURAL RESOURCES, U.S. SENATE
MARCH 6, 1989

Mr. Chairman, and distinguished members of the U. S. Senate Committee on Energy and Natural Resources. Thank you for the opportunity to be here today to express ARCO's views on S. 406 and matters affecting this important legislation.

I am Larry Morse, Manager of Prudhoe Bay and Lisburne Field Operations for ARCO Alaska, Inc. I am a mechanical engineer, and for a large portion of the time since 1976, I have been involved with the development and operation of ARCO's North Slope oil fields. Assisting me this morning is Jim Posey, also of our Anchorage office.

As you may recall, Jim Weeks, my predecessor as Prudhoe Bay and Lisburne Manager, testified before you in October of 1987. My remarks today will review and expand upon that testimony. I'll be happy to answer your questions at the end

of this presentation.

What I'd like to do this morning, after brief remarks on the need for ANWR legislation, is to take you through a hypothetical oil field development in ANWR's 1002 area, presenting a likely sequence of events in this process, while providing a historical overview of some changes that have occurred during North Slope oil field development. Then I will briefly describe how current and upcoming improvements in technological, environmental, and operating practices in our current North Slope operations may be applied to ANWR. I'll also review some recent environmental study results. I will conclude my presentation with comments on some of the key issues facing this committee on ANWR, and by offering several proposals for changes in S. 406.

First, we applaud your efforts, Mr. Chairman, and those of the Committee, in pursuing the opening of the 1002 area to oil exploration and development. There is a real need for federal legislation opening ANWR now. As you have recognized, Mr. Chairman, oil imports are rising sharply and domestic production is falling every year. And, while crude oil and gas is plentiful and prices are still relatively low, that will not always be the case. Arctic oil exploration and development takes time: as much as 10 years or more from lease sale to refinery. We

know that opening the 1002 area is a difficult decision for Congress to make at this time, but it is a wise and prudent decision, one which stands on an intelligent assessment of the future.

We have heard criticism that the oil likely to be found in ANWR's Coastal Plain will make only a negligible contribution to the country's energy supply, that all considered, it is likely to represent only a couple of months supply. Well, of course, you can't remove it all at once, and the point is that one or several new large discoveries in ANWR would serve as a buffer, a national insurance policy against severe international swings in energy supply and prices. But this can occur only if the necessary steps are taken now to begin the lengthy development process.

Another important but largely overlooked aspect of ANWR development is that large quantities of natural gas are predicted to be found in the 1002 area--the Interior Department 1002 report predicted a 95 percent chance of finding at least 1 1.5 trillion cubic feet of gas in place. If current concerns about global warming are verified, natural gas, which is low in carbon dioxide and other pollutants when burned, will be a fuel of choice. ANWR's gas, along with the tremendous untapped natural gas reservoir at Prudhoe Bay, may well

become assets important to the nation's environmental and energy future. Again, look to the future.

Let me now shift to how ARCO, as an existing Arctic oil field operator, might foresee actual development in ANWR. There seems to be some apprehension that exploration and development in the 1002 area will be more difficult than prior Arctic development or pose unique problems. I hope to dispel that notion. We believe that ANWR development can be accomplished prudently using the next generation of technology and methods currently employed at Prudhoe Bay, Kuparuk, and Lisburne.

For purposes of discussion, I will assume two ANWR discoveries have been made, one marginal, one large, and see how development might unfold. The Interior Department 1002 report identified 26 prospects for oil and gas development. My discussion will focus on Prospect Number 6 in the Marsh Creek Area, a large field, and Number 19, a smaller field, in the vicinity of the Niquanak River. These are shown on Attachment 1.

Development of actual discoveries, of course, requires extensive environmental, engineering, geotechnical, hydrological, and geophysical study. I've also assumed here

that an EIS has been prepared and approved and the myriad of Federal, State, and local permits are in hand. This series of steps is in many ways the most difficult and time consuming. And, if S. 406 were to be enacted as it is now written, we are certain that existing permit acquisition times would substantially increase.

Let's assume that Prospect 19, the larger of the two, is developed first, since very large accumulations are needed to support the remote construction of pipelines, access roads and infrastructure that will then allow development of smaller fields.

First, access is required. Initially, ice roads would be constructed in the winter, either over the sea ice from Prudhoe or from the northern shore of ANWR. Fresh water for the ice roads could be obtained from numerous lakes in the area as you see on Attachment 2, an enlargement of the Prospect 19 area.

Next, a gravel source would be located and developed. There are numerous approved methods for doing this. For this hypothetical example, I've assumed that the gravel would be obtained from borrow pits adjacent to streams, the technique currently recommended by resource agencies. These are

shown as elongated rectangles on Attachment 2. After the pits are depleted of gravel, or no longer needed, they will be flooded with water, thereby creating important fish over-wintering and waterfowl habitat. It is important to note that this improvement in valuable and scarce habitat might be precluded by Section 402 of S. 406, which requires reclamation and restoration to original conditions.

Next, pads, roads, and other necessary surface facilities would be built. Based on our experience on the North Slope, less than 1 percent of the surface area within Prospect 19 would be covered by, or excavated for, gravel.

The gravel pads for the construction camp, roads, port, airstrip, as well as the gravel road to connect the ANWR area with existing Prudhoe Bay roads, would be elevated several feet above the tundra to insulate the permafrost from thawing and subsiding. Depending upon soil conditions, less than the three to five feet of gravel fill used in existing North Slope development may be needed in ANWR.

After the main road network, the next order of business is living quarters for use during construction of the field facilities and pipelines. Water for the camp and drilling operations could be taken from a flooded gravel pit, a deepened lake, from

melted snow accumulated by snow fences, or, if necessary, from a seawater desalination plant or possibly from a treated saline water source below the permafrost. The exact technique will require further study, but we believe that water supply would not be an issue in ANWR development.

After the camp was built, production facilities and pipelines come next. Oil and gas processing facilities would, as in the past, probably be fabricated at one of a number of possible locations in Alaska or the Lower 48 states and moved north on trucks or ocean going barges in the summer. The barges would be towed to the port, the modules unloaded, hauled overland and set on pre-installed pilings, interconnected, and made ready to receive oil and gas. From the start of design until the modules are in place, requires at least three years.

While these production facilities were being fabricated, field pipelines and a trunk oil pipeline to Prudhoe Bay would be constructed.

The construction technique would, no doubt, be similar to those techniques proven reliable at Prudhoe, Kuparuk and Lisburne. Attachment 3 traces the evolution of pipeline construction techniques in the Arctic. At Prudhoe the original pipelines were constructed adjacent to a construction pad.

which allowed construction of the pipeline during the warmer summer months. Separate roads were built for normal vehicle traffic to and from the wells and facilities. The pipelines were fairly close to the ground, and gravel ramps were constructed over the pipelines to allow for caribou migration.

At Kuparuk, the separate pipeline construction pad was eliminated, and the pipelines were placed 25 feet from the main roads. Pipelines were also elevated a minimum of 5 feet above the tundra to facilitate caribou migration since experience at Prudhoe indicated ramps were not preferred. Advancements in pipeline construction techniques made it possible to construct pipelines in the winter from ice roads, thereby eliminating the need for the pipeline to be close to the gravel road. Pipelines on the Slope are now being elevated a minimum of 5 feet and separated by several hundred to a thousand feet from the roads. This concept allows virtually unimpeded movement of the caribou under the pipeline year round. It may even be possible to bury portions of the trunk pipeline from ANWR to the TransAlaska Pipeline System (TAPS), depending upon soil characteristics. A separate construction road for the trunk line might be needed, but conceivably the main access road or an ice road could be used to construct the pipeline.

In-field pipelines would be built during the same interval in much the same manner. These lines deliver oil and gas from the wells to the production facilities for processing.

Next, sufficient wells would be drilled to start-up the oil field at the rate desired. The plan to be used for drilling would be to directionally drill wells from the compact drill sites. This technique has evolved considerably in the course of North Slope oil field development. When we first pioneered the design of production facilities at Prudhoe, there was very little operating history or understanding of what would work best on the North Slope, so our approach was conservative. For instance, wells were spaced 160 feet apart so that the derrick of a conventional drilling rig could be laid down without obstructing the next well, as shown on Attachment 4. Since it is environmentally and economically prudent to locate wells in clusters to minimize the amount of gravel used in pads, this concept required a long narrow drill site to accommodate the necessary wells to develop the reserves. Drilling muds and the cuttings removed from the hole were then placed in gravel reserve pit impoundment areas adjacent to the drill pad.

Technological advances since this initial concept enabled us to develop Kuparuk with wells 60 feet apart. This means that there is less gravel placed on the tundra, reserve pits for muds

and cuttings are smaller, and that the overall landscape changes are minimized. We've drilled over 1,000 wells at Kuparuk, Prudhoe, and Lisburne and drilling rig technology and our confidence in close well spacings gained through experience has now progressed to the point where we now can drill wells 25 feet apart, using one specially designed rig such that only the derrick, rather than the entire rig, is cantilevered over the well.

At Prudhoe, the reserve pits were designed to be large enough to hold all the cuttings and liquid mud from all wells anticipated to be drilled on each pad. Since then we have developed mud systems and solid control techniques so that the fluids are separated from the solids. The fluids - mostly used drilling muds and water - are injected into the annulus of one of the wells on the pad. The annulus is that area in a well between two strings of casing which opens at the bottom into approved injection zones.. This allows for drilling fluids to be injected into the salt water zones well below the permafrost at a depth of 2 to 4 thousand feet where they will be permanently confined. Therefore, reserve pits are only used for the solids -- principally the cuttings removed from the hole, and mud solids, mostly naturally occurring clays and barite used in the mud systems.

Further refinements in waste handling and many of the concepts that are under development, which I will describe in a moment, may be applicable to ANWR development. New reserve pit technology that we have developed at Kuparuk, as shown on Attachment 5, results in the permafrost being excavated deep below the tundra surface. The material that is removed is stockpiled adjacent to the hole. Cuttings and mud solids removed from the well are placed into this hole. Fluids from the drilling mud are injected down an annulus. Once a row of wells on a pad is drilled, the material that was previously removed from the excavated hole in the permafrost would be placed back over the mud solids and drill cuttings to allow the muds to freeze back in place. The top of the pit would be covered with topsoil and allowed to revegetate. Thus, the drill cuttings and mud solids would be encapsulated by freezing and would remain at that location. This technique has already worked well at a number of North Slope drilling sites and will no doubt work well in ANWR. It also complies with the 1987 State of Alaska solid waste disposal regulations for new reserve pit design and close out.

For the size oil field assumed for Prospect 19, it would be necessary to construct 13 drill sites, each with approximately 60 wells. Each of these drill sites would require no more than 60 acres of land. To help visualize the effect of this

development phase, please refer to Attachment 7, an artist's rendering of partially completed development drilling program. For the majority of the life of the field, the drill site would appear as shown on Attachment 8, with no rig in place and no open reserve pits. At the end of the life of the field, cement plugs would be placed in the well across all producing intervals, and at the surface to plug and abandon the wells in accordance with state regulations. Surface facilities would be removed, and the mounds that were created as a result of covering cuttings would be contoured and rehabilitated as necessary. Over time the former pads would gradually assume the shape and characteristic of their native surroundings, as depicted on Attachment 9, an artist's rendering of the drill site 5 to 10 years after abandonment. Again, Section 402 of Section 406 might be read to preclude this remediation method. We believe that restoration and rehabilitation requirements should be based principally upon creating or restoring useful habitat and avoiding the risk of future environmental harm rather than making aesthetics the paramount concern.

In the hypothetical Prospect 19, there would be two oil processing facilities, one port facility, and one airstrip. If it were to be necessary to waterflood the oil reservoir later in its life, sea water would be used. Sea water depth at the location of

the port facility is sufficient to allow a sea water treatment plant to be constructed without a causeway. At the location shown, the water depth is 24 feet. At Prudhoe Bay it was necessary to build a causeway 3 miles out into the open sea to get to 12 feet of water.

Let us now move to a smaller prospect, and I've selected Prospect 6 out of the Department of Interior report, to show what a smaller development might look like. This development is shown on Attachment 10. It might require only two drill sites and one production facility. In concept it would be very much the same as for Prospect 19. A pipeline would connect production from this facility to the main trunk line between Prospect 19 and the Trans Alaska Pipeline System. Surface impact on this field would be even less than that from Prospect 19. Again, the near shore water depths in Camden Bay are 18 feet, so it would be simple to place a seawater treatment plant at that location without having to construct a causeway.

It would not be necessary to build a large support base to support the drilling and production activities in ANWR since a major support base already exists south of Prudhoe Bay in an area known as Deadhorse. The Deadhorse area is capable of serving a large percentage of the needs for the development of

ANWR. Some temporary facilities would be needed to construct the pipeline and the production facilities, and permanent facilities would be needed to support contractors and service companies. These facilities could in concept be similar to the Kuparuk satellite support base called the Kuparuk Industrial Center (KIC). This is a North Slope Borough owned, native corporation operated, satellite support base that is available for lease to all service companies and contractors serving the Kuparuk River oil field. The KIC has avoided the duplication and sprawling which has occurred at Deadhorse.

Attachment 11 is a large aerial photograph of the entire 1002 area. Please note the 1002 area is outlined by the white border on the large photograph and it is the area north of the Sadlerochit Mountains on the Coastal Plain of the Arctic National Wildlife Refuge. The roads, pads and facilities shown in green on Attachment 11 are the same ones just described for the hypothetical development of Prospects 19 and 6, and the routing of the road and pipeline is that suggested in the Interior Department's 1002 report. It is noteworthy that, though hard to see, the depictions are to scale, and, in an overall sense, the visual and land use impacts of these developments are quite small.

Now I would like to describe some current and upcoming improvements in technological and environmental practices anticipated for use in the existing North Slope oil fields which would likely be incorporated in ANWR development. The areas where significant changes have been implemented or are under investigation for future use that I will describe today deal with drilling operations, waste handling practices, and facilitydesign.

In the drilling area, we are designing and testing extended reach wells to allow oil recovery from areas without additional drill site construction or from relatively inaccessible areas. While this technique is expensive and has physical limits (such as the depth of the target reservoir), it is promising. The reach or departure of a well is that distance from the surface of a well to a point directly above the bottom of a well. This concept is shown on Attachment 15 in the notebooks. We have modified Lisburne development to eliminate the need for an offshore causeway and gravel island drill site facility using extended reach wells. This could potentially minimize the number of drill sites that ultimately may be needed in the ANWR Prospect 19 development scenario just reviewed.

Regarding waste handling practices, we have recently pioneered another way to dispose of well cuttings and mud. At

Prudhoe Bay locations, we have permitted and built large 8 to 10 feet diameter by about 125 feet deep augured holes to dispose of this material. Attachment 12 shows a sketch of these holes after use. These vertical reserve pits, if you will, are filled almost to the top of the hole with cuttings. Some of the soil taken from the hole is placed on top to bring the hole up to grade level. The remainder of the augured out material is then used for construction purposes in the field. This can reduce the amount of gravel to be obtained from other sources. Again, the wastes are permanently frozen and contained by permafrost. We are currently evaluating the practicability of using this technique more widely on the North Slope.

We have also moved to the use of mud systems which are environmentally benign, guided by EPA's specific list of mud constituents which the agency permits to be disposed into the ocean without treatment. By eliminating any question about mud constituents, we may be able to recycle cuttings rather than dispose of them in reserve pits. Thus we are now looking at the possibility of using the gravel and sand cuttings from the top several thousand feet of each well for construction purposes rather than placing this material in reserve pits. Since muds to drill the top hole are similar in chemical traits to native materials, they may, subject to agency approval, be recycled in the field to other productive uses. Attachment 13

shows the volume reduction of drilling wastes that may occur from implementation of this practice. We are currently reviewing this concept with the appropriate regulatory agencies.

In the area of facility design, the drill site processing facilities originally used at Prudhoe were so large and weighed so much that they had to be transported to the North Slope by barge during the brief open water period each year. The drill site modules currently used for Prudhoe, Lisburne, and Kuparuk field expansion are smaller and lighter, which allows them to be trucked to the North Slope. This situation not only provides more flexibility in field development, but also further reduces the drill site size requirements.

Now I would like to provide a short commentary on some key ANWR issues. Regarding land use, especially with respect to the effects on wetlands loss, all current development on the North Slope, including the oil field areas, has changed the surface of less than 20,000 acres out of the 37 million acres of wetlands on the North Slope. (Actual oil field development has occurred on about 8,000 acres.) This 20,000 acres equates to about 0.05 of 1 percent of the available habitat area. This indicates, to us, that we have not significantly limited the available wildlife habitat areas with existing development.

ANWR development will not significantly change this conclusion. It is also important to note that North Slope wetlands are not in short supply as habitat for birds and other animals. Wetlands habitat for existing and predicted populations of animals is plentiful. Over-wintering habitat for fish, which would be created by flooding closed gravel mines, is in short supply.

Another issue that has been raised is air quality. North Slope oil field air quality has been monitored for many years. This data shows that the emission levels occurring in these oil fields are well below the National Ambient Air Quality Standards (NAAQS) set for these areas. Our equipment is overwhelmingly natural gas fired, which is clean burning and relatively pollution free. It is likely that ANWR development would also utilize gas fired equipment.

Caribou populations of the Central Arctic herd, which migrates to the Prudhoe/Kuparuk areas in the summer, have increased from 3,000 animals in the early to mid-1970's to over 16,000 caribou today. This past summer, we had large aggregations of animals - 6,000 to 7,000 - in the Kuparuk field. They moved unimpeded throughout the field, helping to answer criticism that earlier North Slope caribou studies were not relevant to potential effects on the larger Porcupine herd

which uses portions of the 1002 area.

Bird monitoring studies continue to confirm that birds are not being stressed, disturbed, or displaced from existing oil field areas. Their density, nesting, and brood rearing patterns are comparable to similar North Slope habitat distant from the oil fields.

Let me now turn to some critical comments on S. 406.

There are three sections of the bill which I would like to briefly discuss and to which I would like to suggest alternatives.

1. Section 203. LEASE SALES. Section 203(c) mandates a phased leasing program for the 1002 area, with the first lease sale to encompass no more than 300,000 acres. We believe this leasing methodology is unwise and not in the public interest. In our view, it is likely to substantially diminish or delay lease sale proceeds, force inefficient and duplicative facility development and may well create difficult problems in reservoir and field management.

We are unaware of any sound reasons why phased development is necessary or desirable. We therefore recommend that the mandatory provision for phased leasing

be deleted. As you know, the Secretary of the Interior has discretion under existing law to establish reasonable limits on oil and gas leasing of federal lands. If necessary, the Congress could instruct the Secretary to lease with due consideration of specified goals. Given the inherent unpredictability of exploration, oil prices, and supply and similar considerations, it is important to preserve the Secretary's flexibility in leasing decisions.

2. Section 301. NO SIGNIFICANT ADVERSE EFFECT STANDARD TO GOVERN AUTHORIZED COASTAL PLAIN ACTIVITIES. Section 301 requires as follows:

> The Secretary shall administer the provision of this Act through regulations, lease terms, conditions, restrictions, prohibitions, stipulations, and other provisions that ensure the oil and gas exploration, development and production activities on the Coastal Plain will result in no significant adverse effect on fish and wildlife, their habitat, and the environment, and that shall require the application of the best commercially available technology for oil and gas exploration, development, and production, on all new exploration,. development, and production operations, and whenever practicable,

on existing operations.

As we have pointed out in our testimony above, we believe that existing North Slope oil field development has been accomplished without "significant adverse effect on fish and wildlife, their habitat, and the environment," but there are clearly those who differ with us on this issue. Without some clear standards on what constitutes a significant adverse effect (for example, by reference to compliance with existing law and regulations) we believe that, at the very least, substantial confusion and delay may be interjected into the development process. This provision could be interpreted to require the Secretary of the Interior to establish sets of entirely new ad hoc environmental and resource utilization rules which would supersede or conflict with existing regulations and might well take years to sort out. We believe existing environmental laws and regulations are comprehensive, protective, and reasonably predictable; we do not believe that S. 406 should modify that regime without strong and specific reason to do so. We do not believe the record supports such a change.

Further, the requirement that the Secretary require the use of the best commercially available technology for exploration and development may be even more troublesome.

Arctic oil field technology is different from technology used elsewhere. Often, equipment and practices used in warmer climates do not work in the Arctic. New practices must be designed, tested and adapted, usually in an incremental way, so that safety, environmental quality, efficiency, and effectiveness can be assured. Will the Secretary be compelled to become intimately involved in facility design and operating decisions and in evaluating the transferability of industry technology from other geographic areas? If so, what standards will govern these decisions? Will the existing North Slope oil fields be required to be retrofitted to meet these standards? We believe that this provision should be deleted or modified to allow the Secretary to require additional measures, but only in ANWR and only where warranted by specific site conditions and only where it is clear the technology will work in the Arctic.

3. Section 402. STANDARD TO GOVERN LAND RECLAMATION. Section 402 requires the reclamation and restoration of disturbed lands to "a condition as closely approximating the original condition of such lands as is feasible using the best commercially available technology." As indicated in our testimony, we believe that this mandate is unwise, since it will preclude restoration methods which will

add new habitat or creatively adapt changed lands to different but valuable uses. We do not believe that aesthetic restoration to the original condition of the land should be the principal goal. Rather, the goal should be one of returning the lands to productive capacity as habitat or to such other uses as are determined by the Secretary at that time to be appropriate. We therefore recommend that this section be deleted or that the Secretary be given discretion to set restoration and rehabilitation standards when development uses have ceased.

These three sections of S. 406 appear to us to pose particular problems. We believe that the bill could be improved in other respects as well and offer to work with the committee to achieve legislation which will allow for reasonable development while preserving important environmental values.

I extend my personal - and my company's - invitation to you to visit the North Slope. I hope that any of you that have not seen this vast and remote area will come north this summer.

Thank you again for the opportunity to be heard. I will be happy to answer any questions you may have.

ATTACHMENT 1

CHAPTER III

ASSESSMENT OF OIL AND GAS POTENTIAL AND PETROLEUM GEOLOGY OF THE 1002 AREA

INTRODUCTION

This chapter presents the assessment of the oil and gas potential of the 1002 area of the Arctic Refuge. This assessment and the discussion of the petroleum geology of the 1002 area are based on surface geology studies and 1,338 line miles of seismic surveys (approximately a 3x8-mile grid) conducted by industry and the Department of the Interior. Although all seismic data were collected by industry, the analyses presented here are based on interpretations of that information by the U.S. Geological Survey (GS) and the Bureau of Land Management (BLM).

This chapter is organized as follows: first, significant results of the resource assessment are summarized; second, the geology of the 1002 area is briefly described, indicating the types of rocks and structures which might be present; third, the likelihood that oil and gas resources are present is assessed through the use of geological "play" analysis which leads to estimates of the amount of resource potentially beneath the surface of the 1002 area, without reference to its recoverability; and fourth, the possibility of recovering these potential resources is assessed by including technological and economic considerations.

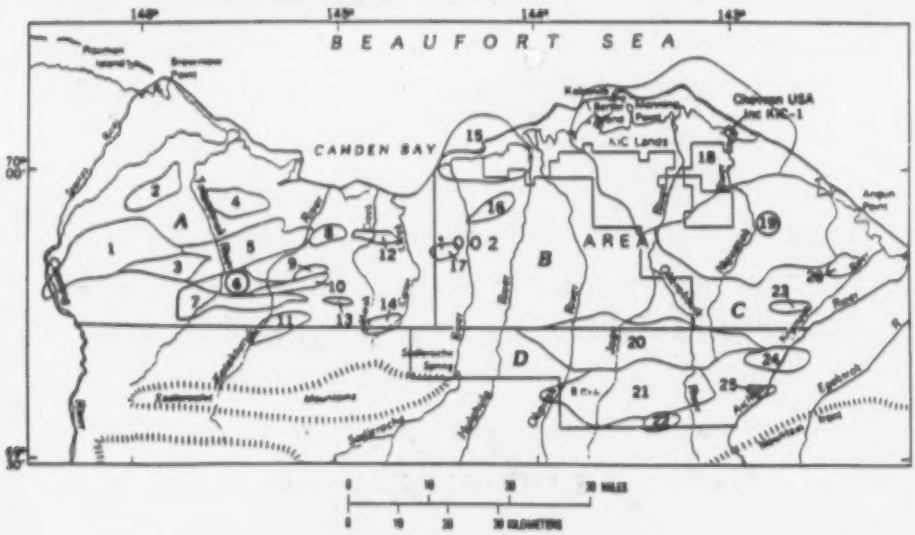


Figure III-1.—Seismically mapped prospects (1-25) and resource blocks (A-D) in the 1002 area. (Prepared by the Bureau of Land Management.)

One way to assess the oil potential of an area is to compare estimates of the amount of oil in that area with the estimates for other areas. Table III-1 shows the conditional economically recoverable resource estimates for the 1002 area and for the Outer Continental Shelf planning areas. The table also shows the marginal probability (MP_{HC}) that economically recoverable resources exist in each area--in other words, the probability that the "condition" on which the conditional resources are based is true. If the conditional resource estimates are adjusted for their respective marginal probabilities, the 1002 area ranks sixth out of all the areas, with three of the higher five already in production. Consequently, these estimates show that the 1002 area is one of the most outstanding prospective oil and gas areas remaining in the United States. ~

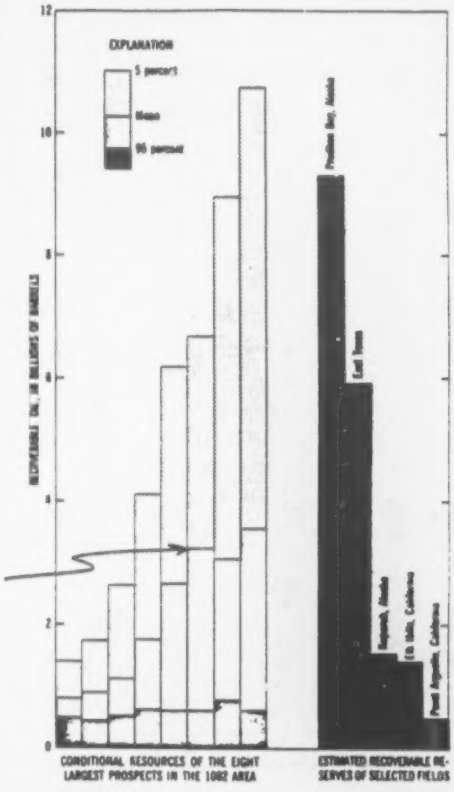
An area's potential can also be assessed by examining the individual prospects identified within the area. Figure III-2 shows the conditional resource estimates for the eight largest 1002 prospects in comparison with the largest known fields in the United States. If recoverable resources are present, the two largest prospects each have a 5-percent chance of at least equaling the size of Prudhoe Bay; the next two largest prospects each have a 5-percent chance of rivaling the East Texas field; and the next four each have a 5-percent chance of exceeding fields such as Kuparuk, Elk Hills, and Point Arguello. The probability that any one of these prospects has economically recoverable resources is less than the overall area-wide probability of 19 percent. Although the chance of discovering a field of 10 billion barrels, or even 1 billion barrels, is small, the chance is far greater in the 1002 area than in other onshore areas of the United States. Such chances of an enormous discovery indicate a very attractive area for oil exploration. For perspective, in 1982, 1,402 new-field discoveries were reported for the United States, but only 652 million barrels of hydrocarbon liquids were discovered in the new fields.

Reserves assumed for prospect 19.

SUMMARY OF METHODS

Methods used in estimating potential in-place and recoverable oil and gas resources in the 1002 area rely on two related techniques using similar components of the geologic data base. Each assessment depends fundamentally upon recognition of potential petroleum traps (prospects) and description of their geologic and fluid characteristics. Particular care was taken to ensure consistent data treatment, honoring information from the geologic studies.

Generally, the assessment of in-place resources deals with prospects in the aggregate. The recoverable resources assessment deals with separate assessments of the larger (or selected) prospects which are then aggregated. Estimation of in-place resources includes both identified prospects and those estimated to exist on the basis of geologic setting. This includes both structural and stratigraphic traps. However, estimating of recoverable resources was limited to those prospects (all structural) which can be identified and delineated with a reasonable degree of certainty, and which are physically large enough to reasonably be expected to contain commercial quantities of oil.



~ **Figure III-2.**—Conditional, economically recoverable oil resources of the eight largest prospects in the 1002 area compared with estimated ultimate recoverable reserves of five known producing fields. The recoverable resources are modified from McCaslin (1986, p. 318-319). The geologic probability of a significant oil occurrence in the eight prospects ranges from 3 to 10 percent. ~

Table III-2.—Data on seismically mapped petroleum prospects in the 1002 area shown in figure III-1.

[Depths are below mean sea level. Potential objectives: 1, pre-Mississippian carbonate rocks; 2a, Ellesmerian clastic rocks; 2b, Ellesmerian carbonate rocks; 3, Thomson/Kemik sandstones; 4, turbidites; 5, lower Neogene(?) topsets. Data from Bureau of Land Management, 1988.]

Prospect	Area (acres)	Size (miles)	Crestal depth (feet)	Lowest closing contour (feet)	Potential objectives						Number of seismic lines
					1	2a	2b	3	4	5	
1	48,512[1]	18 X 6	14,000	15,000	X	X	X	X	X	–	5
2	11,793	6 X 3	14,820	15,000	X	X	–	X	X	–	2
3	13,120	12 X 3	13,000	14,200	X	X	X	X	X	–	3
4	12,922	8 X 3.5	14,900	15,500	X	–	–	X	X	–	4
5	34,234	16 X 4	12,700	15,000	X	X	–	X	X	–	6
6	11,940	10 X 3	11,500	13,800	X	–	–	X	X	–	3
7	18,970	16 X 2	8,500	10,500	X	X	X	X	X	–	6
8	4,880	4 X 2	16,300	17,000	X	–	–	X	X	–	2
9	2,200	4 X 1	12,500	13,200	X	–	–	X	X	–	1
10	8,291	11 X 1	11,900	12,500	X	–	–	X	X	–	3
11	9,430[1]	8 X 3	5,200	6,000	X	X	X	X	–	–	2
12	3,950	6 X 1	19,000	21,000	X	–	–	X	X	–	2
13	1,344	4 X 0.8	10,900	11,500	X	X	X	X	–	–	1
14	4,915[1]	5 X 2	5,840	6,000	X	X	X	X	–	–	1
15	42,500[1]	13 X 10	22,500	23,000	X	–	–	X	X	–	6
16	6,720	6.3 X 2.4	1,230	2,300	–	–	–	–	X	X	3
17	3,170	3 X 2	21,800	22,000	X	–	–	X	X	–	1
18	228,822[1]	27 X 15	13,500	>24,000	X	–	–	X	X	–	16
19	129,567	22 X 13	9,780	17,000	X	X	X	X	X	–	10
20	78,738	30 X 7	11,900	17,500	X	X	X	–	–	–	10
21	66,300[1]	21 X 4	7,500	14,500	X	X	X	–	–	–	7
22	4,560[1]	5 X 2	11,800	12,000	X	X	X	–	–	–	1
23	3,708	5 X 1.5	16,300	16,500	X	X	X	–	–	–	1
24	11,872[1]	8 X 3	10,400	12,000	X	X	X	–	–	–	4
25	2,360[1]	4 X 1	11,950	12,000	X	X	X	–	–	–	1
26	4,954	5 X 3	16,500	17,000	X	X	X	X	X	–	2

[1]Prospect area includes extensions or projections outside the 1002 area as shown in figure III-1.

– According to the size, number, and characteristics of prospects described in Chapter III, and the production and transportation scenarios described in Chapter IV, the number and types of facilities likely to be required for development and production of oil resources in the 1002 area are listed in table V-1. For the sake of maintaining data confidentiality, figure V-1 shows a highly generalized placement of production and transportation facilities based on typical North Slope prospect characteristics for three localities within the 1002 area. This assumes successful exploration in all three localities. –

Actual placement of oil production facilities and marine facilities on the 1002 area, or location of the trunk pipeline from producing fields to TAPS Pump Station 1, depends upon site-specific geotechnical, engineering, environmental, and economic data that can be determined only after a specific prospect has been drilled, and a discovery made and confirmed.

Chapter IV describes the types and numbers of facilities that might be necessary for oil production in the 1002 area. Typically, these include for each developed prospect: central production facility (CPF) and initial pump station for the oil pipeline, all-weather airfield, consolidated production and reinjection well pads, and an internal network of roads and gathering lines connecting pads and the CPF. A trunk oil pipeline would connect the CPF to Pump Station 1. From Pump Station 1, oil from the 1002 area would move through the existing TAPS to Valdez and then by tanker to market. Depending on the amount of final through-put, one or several additional pump stations may be required.

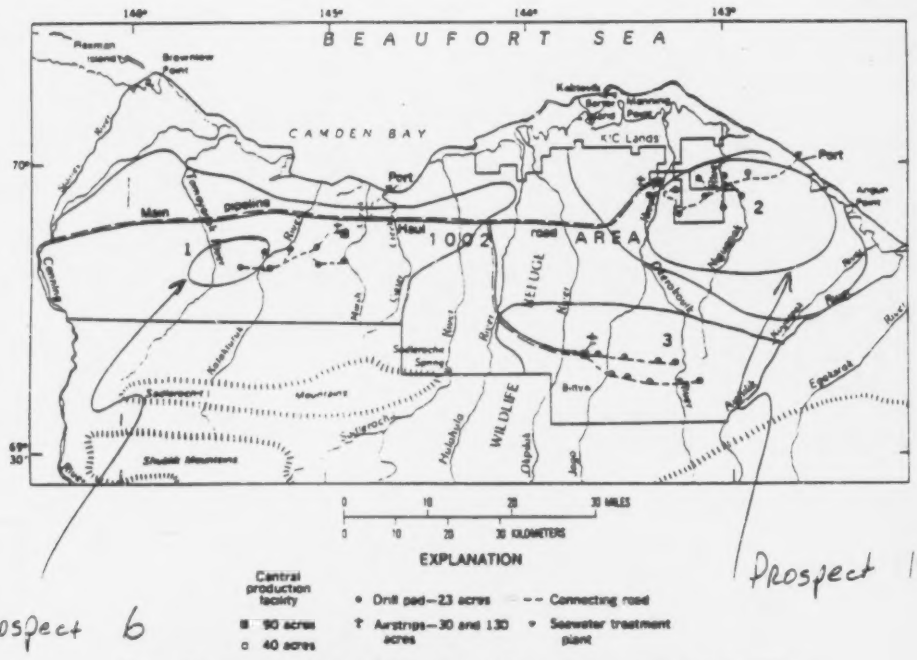


Figure V-1.—Hypothetical generalized development of three major prospects within the 1002 area under full leasing if economic quantities of oil are discovered. Numbers indicate three localities (shaded) having typical prospect characteristics.

The CHAIRMAN. Thank you very much. I hope to have another Committee trip there this year. I have been to Alaska four times, and want to go back.

Mr. Yeager, you have heard the testimony about the new technologies—I mean, re-using the cuttings of and injecting the heavy metals into the disposal wells.

Does this allay your fears about water pollution and the cuttings pollution? First of all, are you familiar with the technology?

Mr. YEAGER. Well, I am only familiar to the extent that I have seen the presentation here today.

Let me just say to the committee that, before the hearing, Lisa and I did a little division of labor, primarily because I come from an energy background and she comes from a pollution background, I would be much more comfortable in having her or someone in the environmental community who has a lot of expertise in that area to answer that question.

The CHAIRMAN. All right. If you would tell her, or someone else from the environmental community, we would invite a response to that question in writing.

Mr. Herrera, with respect to tundra, I have heard you speak on tundra before.

How much tundra is there in the North Slope—not just on the North? Slope—is there any in Canada?

Mr. HERRERA. Oh, yes. Mr. Chairman, I am sorry, I do not have a figure, if you include the Canadian tundra. But it is much larger than anything we have in Alaska.

I mean, north of the Brooks Range we have, I think, 56 million acres of it. And it is probably three or four times that amount in Canada.

The CHAIRMAN. Three or four times that amount?

Mr. HERRERA. Oh, yes. At least.

The CHAIRMAN. Is it pristine and undisturbed?

Mr. HERRERA. There are not many people up there.

The CHAIRMAN. Now, with respect to the fishery up there, in the 1002 area, is there any commercial fishing that you are aware of?

Mr. HERRERA. There is the Bud Helmrick's fishery, which catches about 20,000 Arctic Cisco and perhaps 20,000 Lees Cisco every year. That represents about a $100,000 fishery.

But Senator Murkowski's right, the vast majority of those fish are for dog food. There is also a subsistence fishery that probably catches a like amount of fish. But it is believed that that total catch only represents about, something like seven percent of the fish population. And the population can carry that type of mortality every year without any problem.

The CHAIRMAN. Has there been a before and after study of the Prudhoe Bay area, as far as fish population is concerned?

Mr. HERRERA. Yes. Yes, there has been. One of the interesting things about the fish records is that Mr. Helmrick's, the commercial fisherman, kept very accurate scientific records, you might say, over the past 20 plus years, and consequently, we have a historical record to go back on, compared with the present.

And basically, as I mentioned, we are finding that the major fish species are increasing over the past eight or nine years.

The CHAIRMAN. There has been some testimony here, but just to underline it, they have done studies on the fish for heavy metals and that sort of thing, have they not? In other words, the fish have not been poisoned.

Mr. HERRERA. I honestly do not know if they have. I cannot answer that question accurately, Mr. Chairman. I cannot think of any reason why fish would be affected.

The CHAIRMAN. Before I call on Senator Murkowski, I have to go to a 12:15 lunch.

I want to thank all the Members of the panel. We will have some additional questions in writing for you. Thank you very much.

Senator MURKOWSKI [presiding]. Thank you, Mr. Chairman. I seem to have a tendency to be the last member present. Maybe I outsit my colleagues. I do not know. I had a 12:00 o'clock lunch appointment which I missed, but enough of that.

I am interested, Mr. Yeager, in a reference you made in your opening statement regarding the Audubon's policy. I think you stated that the Audubon policy on the ANWR question, after great research and discussion with your board, is that the coastal plain of the Arctic National Wildlife Refuge should be managed, protected, as wilderness unless impartial scientific judgment concludes that the potential oil resource of the coastal plain represents the only method for the nation to meet its energy needs. That is fairly broad, because, we have nuclear power, and we have vast coal resources.

But from the standpoint of uniqueness of ANWR, we do not know if there is oil there, right? That is conceded?

Mr. YEAGER. Correct.

Senator MURKOWSKI. Is it not in the national energy security interests to know if it is there?

Mr. YEAGER. Well, the difficulty of that, Senator, from our point of view, is that there has not been advanced any method of leasing which can allow you to know what is there without committing you to developing it if you find out that there is a produceable amount.

Senator MURKOWSKI. Yet you would grant that there is a number of permits that would have to be obtained if there is recoverable reserves?

Mr. YEAGER. There are a number of permits. But I would point out that last year there was a legislative theory advanced at one point that there should be government exploration of the area, which was opposed vociferously at the time by the oil industry.

Generally, we found it very difficult to disassociate the right to explore from the right to produce what you find, if you find anything. And that has been something so that the defense that, gee, it is only damaging if we find something, does not seem to work very well in practice.

Senator MURKOWSKI. Are you aware of the activity that has been in the ANWR area, the 1002 area? The reference we hear from time to time is that the area is undisturbed, and it will endure in that state beyond our lifetime.

Are you aware of the physical presence of the 250 to 300 people that live in Kaktovik?

Mr. YEAGER. I certainly am aware of that, yes.

Senator MURKOWSKI. Are you aware of any other physical presence there, such as the DEW Line stations. Three DEW Line stations were erected for our national defense purposes?

Mr. YEAGER. I have read last year's Committee record.

Senator MURKOWSKI. Have you been to the area?

Mr. YEAGER. No, I have not.

Senator MURKOWSKI. Well, there is the presence of the DEW Line stations, and there is the small airfield and there are other facilities there as well.

To suggest there is no disturbance on the coastal plain is not totally accurate. But it is quite accurate to say the potential footprint of oil development is almost insignificant.

Are you aware that a portion of the coastal plain area along the coast, is in wilderness. It is between the Canadian boundary and the 1002 area, approximately 30 miles of the 110-mile coastal plain?

Mr. YEAGER. Yes. I think I have seen those maps.

Senator MURKOWSKI. So there is a significant area that is set aside in wilderness that will not bear the footprint of mankind under any circumstances?

Mr. YEAGER. I think maybe it would be appropriate for me to clarify at this point that the way we view the wilderness argument, in effect, is not one of saying that there absolutely has been no human activity here at any time, but that this seems to be a largely undisturbed ecosystem, which as we understand it, and as I understand it from reading the reports of the biologists and the other wildlife experts that have looked at the area, the coastal plain is the central factor in the balance of this overall ecosystem, that we do not maybe know exactly how important it is and there is obviously some dispute about that.

Mr. Herrera has mentioned some studies. The caribou biologists, evidence that was presented to the Committee last year, has mentioned others. But it seems to us that it is an extremely delicate balance in which the wilderness issue is, in a sense, the essence of the overall balance of the system.

Senator MURKOWSKI. I might ask the gentleman if you would put the map of Alaska back very briefly.

You see the area that we are discussing Mr. Yeager, is obviously the green area. Now, if you look at the rest of the coastal plain, to the left. Are you familiar with what is out there, other than the fact that it is about two-thirds the size of ANWR?

Mr. YEAGER. Yes. And I am familiar with the fact that it is all available for leasing and development, as it may be decided by the industry and appropriate state and federal authorities.

Senator MURKOWSKI. Well, we have already done our exploration in the naval petroleum reserve. In about two-thirds of the area we have done extensive exploration and drilling, and just did not find anything. And are you aware of what it is like now? I mean, is it any different from what it was before the 127 wells were drilled out there?

Mr. YEAGER. Since I have not personally been there, I cannot testify to that.

Senator MURKOWSKI. I can assure you, sir, if you were flying along the entire coastal area, you would not know when you were

out of ANWR and in naval petroleum reserve number four, because it is all very unique area.

It is relatively pristine, with the exception of the few footprints. It is a huge area, and when you come to the end of the 1002 area, there is no sign that reads "wilderness". One area flows into the other.

One of my colleagues, when he got off the airplane on the coastal plain, locked around and said, where is the wilderness? There is, of course, eight million acres in ANWR associated in the green area there on the map that is wilderness in perpetuity.

There is another nine million acres just below it. That is wildlife refuge, which means that the access is limited to subsistence fishing and entry for camping, but certainly no development.

So when you say that all the rest of the area is open for oil and gas leasing, obviously this wildlife refuge is not.

Mr. YEAGER. No, I said all the rest of the coastal line, the coastline, except for the 1002 area.

Senator MURKOWSKI. Except for the 30 miles, which is in wilderness, which is pretty substantial.

My problem, sir, is that I want to keep the discussion in perspective. We have 19 million acres in ANWR. We are proposing to lease a million and a half acres.

That leaves 8 million acres in permanent refuge wilderness, 9 million acres in the wildlife refuge, and area—30 miles of the coastal area that is remains in wilderness.

And would you agree with the assessment that has been made that if we lease the entire 1002 area the maximum footprint of oil development would be about the size of the Dulles International Airport complex, approximately 12,500 acres?

Mr. YEAGER. No. I would not agree with that.

Senator MURKOWSKI. Can you please explain?

Mr. YEAGER. I read the same report you have, and it talks about something we believe is more meaningful, and that is the sphere of influence of sphere of disturbance that might be expected from a scenario of oil field development on the Arctic coastal plain, it projects it as 300,000 acres.

So I think that there is probably some discussion about how much of that area is really disturbed, how much area does the dust from the gravel roads reach. A lot of that—

Senator MURKOWSKI. Of course, for about two-thirds of each year there is no dust up here.

Mr. YEAGER. I understand that also. But I would like to say two things, I think, in response to the general line of the question, as I understand it.

One is, it is certainly legitimate for anyone to ask how much wilderness is enough, except that in this case we view, from what we understand from what the biologists and others have told us, that this may be a particularly unique and important wilderness resource.

So that it may not be so much an aggregation of acres as the placement of this area in relation to an overall ecosystem, which is right now in more or less balance.

The second response is that we believe that it is appropriate to look at the other side of that coin. That is, how much leased land is enough?

At this point, several weeks ago, I believe in one of your Alaskan papers, an Alaskan independent oil man was quoted as saying that within the last 5 years more than 100 million acres have been offered for lease on-shore and off-shore in Alaska.

Of that amount, drilling rights have been purchased on approximately two million acres, but fewer than 200,000 acres have actually been tested.

To me, and the information that I stated earlier in my statement about the question about the value of the Chukchi Sea and the Point McIntyre development and others, it seems to us only reasonable that we undertake a fuller exploration of those areas that have already been leased, or in effect been opened for development, before we undertake to sacrifice this particular area for that cause.

The only other thing I would say is that although I do not have personal knowledge of the area, I would put in a word on my boss, the president of Audubon, Peter Burley did want to be here today. He could not.

But he wanted to be here because he has been up there, as have most of the CEOs of the major environmental organizations. He walked 75 miles across the coastal plain last summer, he talked to some Fish and Wildlife employees who were looking at the prospects for a deep water port at Camden Bay.

He, I can tell you, came away convinced, and he is not an unskeptical person, that it was worth quite an effort to try to preserve this place.

Senator MURKOWSKI. You have indicated that if international price of oil was such that it would not basically support climate—and I am paraphrasing—that would initiate active exploration in the U.S.

Are you suggesting that we would be better off if we had a higher price for oil?

Mr. YEAGER. The industry clearly would be better off.

Senator MURKOWSKI. And then we would have more exploration?

Mr. YEAGER. Well, I think it is not so much—I mean, clearly the rig count is down as a result of the low price. And you can quote any number of industry sources for those effects.

I think the point I am trying to make, which has been made in a number of scientific journals in the industry press, is that the major reason for the volume decline in U.S. production is not that we are running dry but that we are capping marginal wells, wells that are not price-competitive to keep producing in the current climate.

Senator MURKOWSKI. Would you acknowledge that we are using up our reserves faster than we are finding new ones?

Mr. YEAGER. No. In fact, I think that has not been the history. I would have to go back to some of the technical documents.

Senator MURKOWSKI. Your answer is no, then?

Mr. YEAGER. Yes. But William Fisher, who is the director of the Texas Bureau of Economic Geology, made a point that is perhaps in connection with what Mr. Herrera had to say earlier.

Mr. Herrera's view, if I remember it correctly, was that since we have been making more additions from infill drilling and existing fields than we have from new discoveries in the last four or five years, that that had to be a dwindling resource.

I believe Mr. Fisher's point is exactly the opposite, that we are more likely to continue to make additions to the U.S. reserve base through infill drilling, and essentially creating recoverable reserves.

Senator MURKOWSKI. My question directly related to new reserves, and we generally include areas out of depleted fields on what the recoverable addition——

Mr. YEAGER. But you have to, as I understand from my coaching from oil friends, you have to make a distinction between a reserve and a resource.

We have not discovered new resources, but we are continuing to discover new reserves.

Senator MURKOWSKI. Well, we will get a couple of opinions, because I intend to ask the industry the same questions. Your answer has been no.

I am going to proceed with a couple more questions. One is to Ms. Moran. The generalization has been made in some of the comments, and I think it was also in the New York Times, that the capability of the state of Alaska to oversee environmental issues associated with Prudhoe Bay is for too limited.

Now, we both know that ANWR is Federal land, so the state does not have the same monitoring and enforcement responsibilities. Does the state concede that they have inadequate environmental oversight capabilities on the North Slope?

Ms. MORAN. No, Senator. We would not concede that. We believe that both the oil industry and the state has a good record up on the North Slope.

A lot of the problems that have been cited come from early developments up there. It has been a learning process, both for the state, and for the industry. And that as Mr. Herrera cited, Endicott does present the state-of-the-art, and our departments of fish and game, DEC and DNR, have not encountered the same difficulties with that development that we have at Prudhoe Bay.

We have had staffing problems in the past up there, and that is usually a function of the legislature and the budgets that go into those agencies. We could certainly use more help than we have in the past, and the governor has requested that. In the last two years the legislature has not been forthcoming in that respect.

But we do think that we do have the knowledge available at this time to go forward in an environmentally responsible manner at ANWR.

Senator MURKOWSKI. I know something about the difficulty of keeping people up there.

I ran a bank up there years ago. And the young fellows I had cashing the checks took one look at the check and jumped on the other side of the counter. I never could keep employees on the job to run the bank, and so we were forced to shut it down.

You and I are Alaskans, and we look at things perhaps a little differently. Can you give me an explanation off the top of your

head as to why the 10 major environmental organizations should identify ANWR as their number one issue?

Why do they pick some place 4,000 or 5,000 miles away from Washington, D.C., instead of cleaning up the Potomac or cleaning up the Northeast corridor between Washington and New York?

You know, it frustrates me because very few people can go to visit ANWR. I think there were about 300 true visitors last year. That is why I try to keep the preservationist arguments in perspective. Which is difficult to do, because if they are not talking about two percent reserves, they are talking about caribou calving, it is very difficult to keep their arguments within reasonable bounds.

Do you have any views, as an Alaskan, as to ANWR has been selected as a major issue that obviously generates membership and generates a lot of initiative on the part of young people who want to become involved in a worthwhile effort, but who never have a chance to really look at the other side of the debate.

They claim that big oil is bad and big business is bad. That we do not need more oil, we can conserve. And then many of these same people save their money and go out and buy a bigger car.

Ms. MORAN. Certainly, Senator, the state of Alaska shares your frustration, as I do personally.

I think my own personal feeling is that Alaska issues are easy issues for the major environmental groups. They are easy issues because their memberships generally reside in the lower 48, and they have no contact with Alaska.

Most of them have never been there before, and it is much easier to sell an issue, you know, many miles away that will never have a direct impact on their members, than it is to address the issues that are in their own backyard, such as Boston harbor, the Potomac, air pollution problems here in the lower 48.

Mr. YEAGER. Senator, may I respond to that?

Senator MURKOWSKI. No. I am not ready to do that. I am going to go through the remaining witnesses, and then I am going to give you all an opportunity to respond.

I have some questions for the industry group. How do you explain—either gentleman, Mr. Herrera or Mr. Morse—in your opinion, the timing of this particular EPA report that I guess has been leaked, as opposed to being an official report of the EPA.

I note that the same writer from the New York Times leaked a different report about a year ago, in a story which was simultaneous to the House hearings. Is this some giant plot, or is it just a leaky ship?

Mr. HERRERA. Well, Senator, the coincidence of having it happen twice, obviously, is too much to swallow, and quite clearly it was a deliberate act, which is a shame, because it is an irresponsible way of doing business.

And that report may have come to the sort of conclusions that perhaps some environmentalists would believe would be correct. But if those conclusions would have been more valid if it had gone through a peer review process before it was put out.

So I do not think they do anybody a good turn by this type of action.

Senator MURKOWSKI. Now, it has been indicated that we can expect to see some slides, and so forth. What are we going to see, in your opinion?

Mr. HERRERA. Well, I do not know, because I am totally unaware of what slides or videotapes were taken.

But the time of year that this visit was made was totally inappropriate for the study that it apparently was embarking upon. I mean, break-up on the North Slope, as you well know, is the messiest time that one can consider. The place is awash in water, the tundra looks dead and awful.

Everything that appears from under the snow, in the way of garbage, which is inevitable when you get strong winds during the wintertime, is there in full sight, and it is not the most beautiful time of the year, and it should not be the time of the year that responsible assessments of environmental concerns should be made.

Senator MURKOWSKI. You have no idea where the information in the report came from, or what motivated some of the militant extreme environmental groups to tip to irresponsible media?

Mr. HERRERA. No, sir.

Senator MURKOWSKI. No explanation?

Mr. MORSE. Senator Murkowski, I would like to comment also on this draft report.

As BP also received a copy last summer of the draft site assessment from Versar, so did ARCO Alaska. We too have commented on that draft report and sent these comments to the EPA. I would like to also offer our comments for the record.

Also, there was a number of the service companies who operate in the Dead Horse area, also commented on that report. And I think it would be appropriate for those comments to also be introduced into the record.

Senator MURKOWSKI. Without objection, I would hope that we could get a copy of that report.

I am curious, everybody would like to have an ideal world, and an ideal world implies certainly why we cannot have an energy policy in this country. And I know my colleague from the state of Washington, who is no longer here, Senator Evans, felt very strongly about having an energy policy.

But Mr. Herrera, you indicated a reference to the Mideast nations coming out with announced reserves of one trillion. I do not know how much of that is shut in.

But with that kind of leverage, does that not imply that we can draft all the policy statements that we want about our own energy policy, but it is a world market, supply and demand dictates price, and if they have got the shut-in reserves, are they not the crucial leveraged point that would make any policy statement subject to whatever they wanted to do in the sense of turning on the supply of oil?

Mr. HERRERA. I think that is correct, Senator. It implies several things.

It implies clearly that the oil era is going to continue for an indefinite time, irrespective of what our position is with regard to domestic supplies of oil. It will be controlled by the world supply which will be plentiful, and should be cheap.

Whether it remains cheap, of course, is a function of the politics of the Middle East, and the buyer and seller market. But it does also imply, as you point out, an energy policy in this country cannot be in isolation to the fact of the plentiful world oil supplies, because they are going to have an impact on it, which is overwhelming.

Senator MURKOWSKI. Who is the public going to blame next year if we see the Mideast tighten up on their oil production and get their act together, in the sense of holding us hostage? Again, we have experienced that—what was that, 8 or 9 years ago?

Who is the public going to blame? Are they going to blame the industry? Are they going to blame the senators on this go-round? Are they going to blame the environmental community?

And, if there is an oil crisis, and we stand in line at the gas stations, the public is going to be very vocal. I think everybody has an obligation to address the "what ifs", we have experienced it once before.

Mr. HERRERA. I do not know who the public will blame, Senator. I mean, you are the politician.

Senator MURKOWSKI. I think they are going to blame government.

Mr. HERRERA. Probably. But clearly, how OPEC as a cartel does its business has proven to be somewhat unpredictable. And it is very difficult to know what they will do in the future.

I mean, clearly also, though, as time goes on, and our domestic supplies decrease, and their market share increases, they will be more and more in the driving seat and able to control world prices of oil.

You know, if you look at the historical record, it is quite interesting. And we do not do it enough in a way. It does have a lesson for the future perhaps.

The historical record of the price of oil in the United States would suggest that we go through a long stable phase of perhaps dozens of years, and then—perhaps a couple of decades or so.

And then we go into all sorts of traumas induced by various, sometimes unpredictable events. And then we will go into another stable phase. Perhaps we are going into a stable phase now, and perhaps those that predict the price of oil will remain relatively at its present level for the next foreseeable future are correct.

The problem with that—of course, it has good economic implications for the nation, if you will, but it has bad implications for our future imports, because undoubtedly we will become more and more dependent on foreign supplies.

Senator MURKOWSKI. Would you give us a reference to the timeframe?

Because my good friend and colleague from Colorado is obviously concerned that we have not had enough study, that we need more information, we need more timely information. We need to have whatever the draft report is from the EPA leak. And I, of course, would like to see the difference between the EPA report draft and the final EPA report.

But you and I and others from Alaska have lived with this process for 15 years or more. We have known Congress was going to set

aside the 1002 area for just this debate. We had evaluated all sorts of studies to determine whether ANWR is needed.

Can you comment as to how you feel we have moved through the study process? Certainly we can have more studies. But there is a reasonable point where a decision must be issued.

Whether it is this time, or later, will be determined by my colleagues and their attitude towards the adequacy of the information before us.

Mr. HERRERA. Yes. I think there has been a very interesting evolution of scientific data collection, if you like, and research pertaining to the Arctic and all development.

In the early days, the oil industry tended to do studies which were either clearly needed or forecast to have merit, and they kept them as tight information, or just released them as company reports.

The problem with that method, of course, is they never received peer review, and were often simply ignored, because the oil industry has a bias in other people's mind. And these things were a wasted effort, despite the scientific nature of much of the data that was collected.

In recent years all of the operators, ARCO and BP on the North Slope and other companies up there, have changed their policy. And now nearly all their research work is published in peer review scientific literature. In this way it becomes much more acceptable.

Now, over the last 10 years or so, in excess of $100 million has been spent on such research. I think it is true to say this year that both ARCO and BP will probably spend individually about $8 million on such research. It is going to be ongoing forever.

We are never going to have all the bottomline answers. But we are certainly going to be increasing our knowledge as time goes on. We are getting into great detail now.

As I mentioned, the air studies, or the effects of air pollution on the tundra, is a very sophisticated type science. But now we are going into that phase, and we learn more and more about less and less. But nevertheless, we will be making forward progress, and we will never stop.

I think that does not preclude reasonable decisions in the meantime.

Senator MURKOWSKI. Mr. Herrera, are you familiar with reports on the causeways that have been discussed here? And does your company have any reports on that issue? What is the current issue on the status of the causeways? I assume it is a question of interpretation between the Corps of Engineers, and perhaps the EPA, or both?

Mr. HERRERA. Yes, Senator. I think it is fair to say the situation was somewhat misrepresented earlier on today.

Basically, as we speak, a meeting is taking place in Anchorage, Alaska between the Corps of Engineers, Fish and Wildlife Service, National Marine Fisheries, EPA, state agencies, and also the BP Exploration, at which meeting all of the various reports which have been produced by the agencies and the oil industry are being synthesized, if you like, or debated, discussed, to try to find out which is black and which is white and which is gray in this problem.

I think the aftermath of that meeting might be much more meaningful as far as decision-making is concerned than the situation we are in now, because we have two separate analyses of the huge amount of data which is available. Sometimes they do not agree, the two analyses do not agree.

The sort of meeting that is taking place now, and also a synthesis meeting which—synthesis process which the minerals management services has set up for April to help resolve these things so that we can come to reasonable scientific conclusions.

Senator MURKOWSKI. This book was passed out. Was it a picture book? Nobody did anything with it.

Mr. MORSE. Senator Murkowski, that is my written testimony.

Senator MURKOWSKI. Thank you. I apologize for not having paid attention.

That basically concludes the questions I have, although I want to give all the witnesses an opportunity to make any concluding brief statements.

I do want to concur with the statement that was made by Ms. Moran, concerning the so-called blackmail clause, and obviously Alaskans are a little touchy on that. We feel that if we go to court and win, we should not be precluded from sharing in the merits.

And to be precluded by a if you win you lose clause, in other words there is no ANWR if you win, seems grossly unfair. I want the record to so note that concern. I would encourage the state of Alaska and the appropriate agencies from the state look at the legal alternatives to that situation.

Obviously, we have to crawl before we walk before we run. And what I am crawling for now is to see if we can get the majority of my colleagues to support the opening of ANWR, as you may have concluded from my slanted questions and testimony.

For the record, I also want to introduce an expenditure compilation that indicates approximately $10.5 billion expended between 1980 and 1986 on oil development dollars spent in the various states, state by state, relative to activity associated in Prudhoe Bay.

[The information referred to follows:]

North Slope Alaska
Oil Development Dollars Spent in the U.S.
1980- 1986
(Millions of Dollars)

*Total = $10,536.2

* This total excludes about $7 billion spent on intangible items for Kuparuk, East Prudhoe Bay, and Lisburne oil fields.

Senator MURKOWSKI. If you wonder what your state got recently, Texas alone got 3.4 billion dollars. That is directly related to purchases of equipment and so forth. So it does clearly cover the entire area of the United States.

I promised everybody they would get one shot, and Mr. Yeager, you had had a difficult time at one point. But I guess you are ready to speak now.

Mr. YEAGER. Well, I just thought that I should, if not correct, expand the record by telling the Committee what Audubon's national priorities are.

Audubon's national high campaign priorities for this Congress are, number one, the preservation and protection of the wetlands, including the Chesapeake Bay, of all places, the Everglades and other non-title wetlands, number two, the reauthorization of a strong Clean Air Act, which I think addresses part of the problem that you, Senator, referred to in the Washington-Boston metropolitan area, number three, the preservation of the Platte River and other prairie river systems, particularly for their migratory wild fowl habitat, No. 4, the preservation of old growth stands of forest in the Pacific Northwest, and number five, the protection of the coastal plain of the Arctic National Wildlife Refuge.

And I would also say that we have an office in Fairbanks, and a representative there, and we have several chapters in Alaska. Admittedly probably not as many people in Audubon live in Alaska as do in Maryland, let us say. But we do have members there who we are very fond of.

The second thing I would like to say is, in response to some of the more off-hand comments from the panel about the—particularly Mr. Herrera—about the irresponsibility or nastiness of leaking information——

Senator MURKOWSKI. I think that was probably my comment.

Mr. YEAGER. No, it was from this side. I would only like to say that we, of course, wish we were not in the position of having to scrabble for every little bit of professional information we can find on this topic.

We have tended to find the opposite, that is that this debate has been characterized within the administration by the suppression of professional information, by the political laundering of professional judgments, and the final reports are rarely as valuable as the early drafts.

And we think that is indeed unfortunate, and that is one of the reasons that we called in our petition for a reevaluation of the information base upon which the last administration made its recommendation to develop the Arctic.

Finally, I would like to echo Mr. Herrera's comments about our future energy situation and simply say that, as far as I can understand it from the professional literature and from the people I talk to, there are two reasons why OPEC is in disarray right now.

One is that the high oil prices that they managed to extort from the rest of the world in 1979 led to tremendous reserve additions in other countries, not so much in the Mideast but particularly in places like Venezuela and Mexico and others.

The second is that the energy efficiency gains that we made between 1973 and 1983 acted as a demand suppressor relative to

OPEC's productive capacity, and that as long as they keep suppressing demand relative to OPEC's productive capacity they will be unable to develop the kind of price squeeze that they developed in 1979.

That appears to us to remain the best strategy for dealing with that situation. Thank you.

Senator MURKOWSKI. Well, I do not know. Professional reputations and professional information, I think, imply that you can hold somebody accountable for the recommendations and actions of somebody who is willing to put their expertise on the line. When we get unidentified leaked reports that come in draft, and you qualified them as professional information, why I have to take exception with that situation.

I might just say that we are honored by the presence of the Wilderness Society in our state, having two offices in our state, in Juneau and Anchorage.

To give you some idea, it is the only state that has two offices of the Wilderness Society. And I would suggest, I did feel left out a little bit, when you talked about old growth timber in the Pacific Northwest and you forgot Alaska. You might as well add us, because we feel left out.

Ms. Moran, do you have any concluding statements?

Ms. MORAN. Senator Murkowski, I would just conclude by saying the State of Alaska does strongly support federal legislation to open the coastal plain of ANWR.

We do think that it can be done in an environmentally responsible manner. And if Congress moves forward with legislation this year, our state agencies are ready to go to work.

Senator MURKOWSKI. Thank you. Please give our regards to the governor. Mr. Larry Morse.

Mr. MORSE. In closing, I would just like to add, there was a question earlier about the impact of ANWR, if it were opened, and the mean size of reserves were found, and what impact that would have on balance of trade? And just doing a quick calculation, that would be about $19 billion annually.

Senator MURKOWSKI. Explain that to me. What does that mean?

Mr. MORSE. That means if you take the mean size of reserves of $3.2 billion, at the current price of approximately $18 per barrel for 30 years, that ends up being right at $19 billion per year.

Senator MURKOWSKI. So that would do what, Mr. Morse?

Mr. MORSE. That would offset new production from ANWR, would offset imports at that rate.

Just one last thing. Much has been said about the size of the footprint, and included in the notebook is this map that shows the entire Alaskan coastal plain, the lighter green being the 1002 area, and then we put the impacted area. Again, the orange is the projected footprint in ANWR, and the blue is the Prudhoe Bay-Kuparuk fields footprint.

And then lastly on the EPA report, we had been told by EPA last year that we would have a chance to have a peer review of that. I would like to compliment the Alaska Department of Environmental Conservation.

They recently issued a report on production waste practices on the North Slope that was sent to all the parties for review. And we

are now in the process of reviewing the first draft of that report. Thank you, Senator.

Senator MURKOWSKI. Thank you very much. Mr. Herrera.

Mr. HERRERA. Senator, I think it goes without saying that the operators on the North Slope have always tried to not only be useful citizens of the State of Alaska but responsible operators.

We still stand on our record. We still correct mistakes when they are made, to the best of our ability. And it is my contention now that we are at the state of knowledge of the Arctic both with regard to the environment and operational techniques to allow us to move into the coastal plain in Alaska in a totally responsible manner, so that we can have our cake and eat it too.

We can produce oil and preserve all of our wildlife, and the other attributes in that area, which we think are special.

Senator MURKOWSKI. A last observation from Mr. Morse. You use the word "mine 'sometimes in your testimony. You are talking about gravel pits, are you not?

Mr. MORSE. That is correct.

Senator MURKOWSKI. Why do you call them mines? I think you mislead a lot of people when you say mines. A mine theoretically is underground, and most of these gravel areas are open pits.

Mr. MORSE. These are surface pits.

Senator MURKOWSKI. You can put water in them and have fish habitat where you did not have habitat before, bird populations would probably increase as well.

Mr. MORSE. That is correct.

Senator MURKOWSKI. I want to thank the witnesses, and I want to thank the Members that had to leave for others appointments. I want to thank the professional staff for their patience, and those in the audience as well.

The record will remain open until the close of business tomorrow. If anyone wants to submit testimony, you are all on equal playing grounds, please do. If you want to counter the New York Times by a letter to the editor, please do. Maybe we will get a leak from the Washington Post tomorrow.

In any event, that concludes the hearing, and I want to thank all those in attendance. The hearing is adjourned.

[Whereupon, at 1:40 p.m., the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

MAR 10 1989

Honorable J. Bennett Johnston
Chairman, Committee on Energy
and Natural Resources
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

Thank you for your letter of March 8, 1989, to Secretary Lujan enclosing questions for the Record of the March 6, 1989, hearing on S. 406 to authorize oil and gas activities on the coastal plain of the Arctic National Wildlife Refuge.

Our responses to a number of the questions you forwarded from Senators Bradley and Wirth are enclosed. We are still preparing the remaining responses and will provide them as soon as possible. If we can be of further assistance, please let us know.

Sincerely,

James M. Hughes
Assistant to the Secretary
for Congressional and
Legislative Affairs

Question from Senator Bradley

QUESTION: II. How many man-years of monitoring Prudhoe Bay operations have been undertaken by Fish and Wildlife Service personnel? How does this effort at Prudhoe Bay relate to the overall effort made by the Fish and Wildlife Service during the preparation of the 1002 Report?

ANSWER: Since the Prudhoe Bay oil and gas operations are confined to State lands where we have no permitting authority for regulating oil and gas activities, the Fish and Wildlife Service has no monitoring program in place. However, the Fish and Wildlife Coordination Act provides the Service with the opportunity to recommend mitigation stipulations that may be incorporated into a permit issued by a Federal (e.g., Corps of Engineers) permitting agency. In that regard, we have conducted limited studies (e.g., reserve pit contaminants, migratory bird habitat loss) to test the effectiveness of mitigation measures that have been recommended and included in permit stipulations. We have also conducted other studies (e.g., central arctic caribou herd) in cooperation with the State and others to measure the response of fish and wildlife to oil and gas infrastructures. These studies have been designed to provide insight into effects of oil and gas activities on fish and wildlife populations so that adverse impacts may be avoided or minimized in the event that oil and gas activities are allowed on the coastal plain of Arctic Refuge. We have no records to indicate the amount of personnel time that has been devoted to these study efforts.

In response to Section 1002 of the Alaska National Interest Lands Conservation Act, the Fish and Wildlife Service conducted 57 baseline biological studies on the 1002 area from 1981 through 1985. The results of these studies are included in a series of annual baseline reports that total over 4000 pages of text. Since the completion of these baseline studies, the Service has continued research activities on the coastal plain covering a full spectrum of fish and wildlife and associated habitats. These studies are supported by approximately $3.5 million in annual funding. However, we do not have readily available information to indicate the amount of man-years, as opposed to dollars, devoted to these activities.

The magnitude of the study effort by the Department on the coastal plain of Arctic Refuge is substantially larger than study programs associated with Prudhoe Bay. This difference is reflective of the Department's statutory responsibilities for management of the Arctic Refuge.

Question from Senator Bradley

Question: How many man-years of effort have been put into research and policy preparation on the North Slope by personnel of the Minerals Management Service?

Response: The Minerals Management Service (MMS) has not had any direct effort in dealing with policy questions regarding onshore oil and gas development on the Arctic North Slope. However, work which has been completed by MMS has provided much useful information which can be applied to North Slope development questions. It would be impossible to assess how much of the available information would be directly applicable to onshore oil and gas operations. During the 15 years that the OCS program has been in existence in Alaska, we estimate that 350 man-years of effort have been put into OCS pre- and post-sale activities pertaining to the North Slope. This includes review and approval of industry plans, preparation of statements of work, draft and final environmental impact statements, environmental assessments, secretarial issue documents, and studies plans, as well as contract monitoring and rig inspections.

Question from Senator Bradley

Question: Could you tell us how many EPA staff monitor Prudhoe operations? Are these personnel located at Prudhoe Bay?

Answer: EPA advises us that staff time spent on monitoring Prudhoe operations equals approximately one and one-half man-months per year. There are no EPA personnel stationed at Prudhoe.

Question from Senator Wirth

QUESTION: What percentage of the Native residents of Kaktovik, Nuiusut, and villages on the Canadian coast of the Beaufort Sea and in the Mackenzie River Delta depend upon coastal fisheries for subsistance purposes? Are these fishery resources migratory through the 1002 area or Prudhoe coastal waters? Are they affected by near-shore marine environmental impacts of the Endicott or West Dock causeways? Please provide us with all analyses of such impacts by the National Marine Fisheries Service and the Fish and Wildlife Service.

ANSWER: In Kaktovik and Nuiusut, a vast majority of the Native population harvest or use fish for subsistence purposes. Fish are seasonally important resources. Survey data seem to indicate that the the people of Nuiusut are dependent upon subsistance fisheries for between 45 to 50 percent of ther diet, while those in Kaktokik depend on fisheries for between 35 to 40 percent of their diet. The Department has no data about the Canadian Beaufort Sea Native population or Mackenzie River Delta populations, but it is known there is subsistence fishing in Canada. Two species of anadromous fish are migratory through 1002 coastal waters (arctic cisco and arctic char). Four species of anadromous fish migrate through or utilize the Prudhoe area (arctic cisco, arctic char, least cisco and broad whitefish). There is serious disagreement within the Department as to whether they have been affected by the Endicott and West Dock causeways. There is no definitive evidence that there are specific adverse population impacts. The differing reports from the Fish and Wildlife Service and Minerals Management Service are enclosed. We have requested information from the National Marine Fisheries Service, and will provide this upon receipt.

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Question from Senator Wirth

Question: Mr. Secretary, when we discussed this issue at you confirmation hearing, you said that you thought "we shouldn't draw lines in the sand" and indicated your belief that if there was reasoned, intelligent discussion about issues like this, that we could get a lot more agreement than if we took polarized positions. Following through on that, let me ask you if you wouldn't benefit from putting together such an approach on this issue?

Answer: I don't believe I have taken a polarized position on ANWR. I have stated that I believe, as does the President, the Alaska Congressional Delegation, the Governor of Alaska, and I believe a majority of the members of the Senate and Senate Energy and Natural Resources Committee that we can, in an environmentally prudent manner, develop oil and gas resources in ANWR. On March 10, I met with a broad cross-section of representatives of environmental groups who discussed this issue along with others. My Department doors are not closed to any group for discussions on these issues. Hopefully through such discussions, we can find some common ground.

Question from Senator Wirth

Question:

Last year in the House, Congressman Weldon offered an amendment to make it clear that the local Native Corporation in ANWR, which can't drill now legally, would not be able to drill before the U.S. had done a first lease sale. The theory of that amendment would be that letting the Native Corporation (ASRC) go first would give them and their partners (BP-America and Chevron) a tremendous information advantage before the first lease sale, and that that might reduce competition for that sale. There is no such provision in the Johnston bill. Should there be?

Answer:

The question correctly notes that the Weldon amendment would limit Arctic Slope Regional Corporation's right to drill exploratory wells on its lands within ANWR. However, the Weldon amendment, as adopted last year by the House Merchant Marine and Fisheries Committee, has several provisions designed to restrict both ASRC's exploration and development rights. It sets out different time frames for when oil and gas exploration and development activities may occur that are based upon the status of the lands that would be affected by the amendment. The amendment would also alter ASRC's procedural rights by requiring it to obtain the Secretary's approval of its plan of operations.

Because the question does not raise these subtleties, it might be beneficial first to discuss the provisions of the Weldon amendment in more detail. The Weldon amendment reads:

> The prohibitions and limitations contained in section 1003 of ANILCA, insofar as they have application to the subsurface property interests owned by the Arctic Slope Regional Corporation or the surface property interests owned by the Kaktovik Inupiat Corporation within and adjacent to the coastal plain, are repealed the day before the first lease sale is held pursuant to section 202(b) of this Act for those property interests described in subparagraph (B)(1) of Appendix 2 of the Agreement Between the Arctic Slope Regional Corporation and the United States of America dated August 9, 1983 (hereinafter referred to in this section as the Chandler Lake Agreement); Provided, That the prohibitions and limitations contained in section 1003 of ANILCA are repealed, as of the date of publication of final regulations issued pursuant to section 202(a) of this Act, for all other property interests owned by the

> Arctic Slope Regional Corporation or the Kaktovik Inupiat Corporation that are subject to section 1003 of ANILCA. Consistent with the provisions of section 22(g) of the Alaska Native Claims Settlement Act (43 U.S.C. 1621(g)), no exploratory drilling activities shall be authorized or allowed to take place, involving those property interests described in subparagraph (B)(1) of Appendix 2 of the Chandler Lake Agreement, prior to the day before the first lease sale is held pursuant to section 202(b) of this Act. For all other property interests acquired by the Arctic Slope Regional Corporation pursuant to section 3 of the Chandler Lake Agreement, no exploratory drilling activities shall be authorized or allowed to take place prior to the publication of final regulations issued pursuant to section 202(a) of this Act. All regulatory environmental stipulations, terms, and conditions regarding oil and gas exploration, development, and production on the coastal plain shall apply to oil and gas exploration, development and production activities involving the subsurface and surface property interests owned by the Arctic Slope Regional Corporation and Kaktovik Inupiat Corporation within and adjacent to the coastal plain: Provided, That, notwithstanding the provisions of section 203(b)(3) of this Act, the Secretary may authorize and approve, on a case-by-case basis, the location of development drilling pads to within one-half mile of the mean high tideline on the coast when deemed necessary to allow for recovery of shallow oil and gas deposits which could not otherwise be developed from a drilling pad located 1.5 miles from the coast. All surface disturbance activities in support of oil and gas exploration, development and production shall be in accordance with a plan of operations which has been reviewed and approved by the Secretary in accordance with the provisions of section 202(c) of this Act.

H.R. Rep. No. 100-670, Part 1, 100th Cong., 2d Sess., 22-23 (June 3, 1988).

The first sentence of the Weldon amendment concerns section 1003 of the the Alaska National Interest Lands Conservation Act (ANILCA). It sets out time frames for the repeal of the prohibitions and limitations found in section 1003 as they apply to lands conveyed to ASRC pursuant to the 1983 Chandler Lake land

exchange agreement. As a result of that agreement, ASRC owns the subsurface estate in lands both inside and outside the coastal plain, as that term is defined by section 1002(b)(1) of ANILCA. However, all those lands are within the exterior boundaries of ANWR and therefore are subject to the provisions of section 1003.

Section 1003 of ANILCA prohibits oil and gas production, leasing or other development leading to production from ANWR until such activities are authorized by an act of Congress. Section 1003 thus prohibits leasing, development, and production, but not exploration. Section 1002 of ANILCA directed the Secretary to establish an exploration program for the coastal plain and called for the collection of information by means other than the drilling of exploratory wells. As a consequence, paragraph B.2 of Appendix 2 to the Chandler Lake agreement prohibits leasing, production, and development of all of ASRC's ANWR lands "until Congress authorizes such activities on Refuge lands within the coastal plain or on ASRC Lands, or both". And, paragraph B.1 of Appendix 2 prohibits exploratory drilling on lands conveyed to ASRC within the coastal plain "until Congress hereafter enacts legislation that permits exploratory drilling within the coastal plain or that permits production, or leasing or other development leading to production, of oil and gas from the coastal plain or the ASRC Lands, or both". As to those ASRC lands outside of the coastal plain, the parties contemplated that ASRC could commence exploratory drilling immediately upon conveyance of the lands and satisfaction by ASRC of the land-use stipulations appended to the agreement. And, indeed, ASRC has exercised this right by drilling one exploratory well on its ANWR lands outside of the 1002 area.

The first sentence of the Weldon amendment would basically lift the prohibitions on leasing, development and production in section 1003 as they apply to ASRC's ANWR lands according to whether the lands are found inside or outside the 1002 area. That part of the sentence coming before the proviso would not allow ASRC to lease, develop or produce from its 1002 lands until the day before the first federal lease sale in the coastal plain. That part of the first sentence contained in the proviso would allow ASRC to lease, develop and produce from its non-1002 lands on the day the final regulations for the coastal plain are published.

The second and third sentences of the Weldon amendment concern exploratory drilling of ASRC's ANWR lands. Like the first part of the first sentence, the second sentence would not allow ASRC to drill exploratory wells on its 1002 lands until the day before the first lease sale. The third sentence would basically suspend ASRC's current right to drill on its non-1002 lands until the publication of the final leasing regulations.

The fourth sentence of the Weldon amendment would extend all regulatory environmental, stipulations, terms and conditions for oil and gas exploration, development and production on the coastal plain to all of ASRC's ANWR lands, but would also grant the Secretary the authority to relax certain restrictions for good

cause. The last sentence would require all surface disturbing oil and gas activities to be governed by an approved plan of operations.

At the time the Weldon amendment was introduced, ASRC argued that it raises taking implications. As a consequence of ASRC's concerns with the amendment, the Solicitor's Office has been examining this issue. Obviously, the application of the Weldon amendment and its effect on ASRC's rights requires an understanding of the purposes sought to be achieved by the amendment, an interpretation of the various provisions of the Chandler Lake agreement, and case law. The Office of Solicitor's review and analysis should be completed in the next 30 days. Once it is completed, the Department would be happy to share that office's opinion with the Committee.

Question from Senator Wirth

QUESTION: Did the Department's studies on ANWR's environment stop after the 1002 report was published? Please supply us with a list of all environmental and wildlife studies which have been completed or for which interim reports have been prepared since the publication of the 1002 report, and provide a brief summary of the findings of each such study or interim report.

ANSWER: No, since release of the 1002(h) report to Congress, the Department has continued to conduct environmental studies on the coastal plain of Arctic Refuge. Since 1988, the Department has expended approximately $3.5 million annually to increase understanding of fish and wildlife resources associated with this area. A brief summary of progress on these studies follows:

Caribou

- The 1987 photocensus indicated a population of 165,000 for the Porcupine caribou herd and 16,000 for the Central Arctic herd. Mixing of the two herds prevented a census of the Central Arctic herd in 1988; however, both herds are scheduled to be censused in 1989.

- In 1988 the majority of Porcupine herd calving was immediately south of the 1002 area between the Jago and Egaksrak rivers; snowmelt on the 1002 area was the latest in at least the past 15 years. Central Arctic herd calving occurred on the western 1002 area during 1988.

- An 83% parturition rate was observed for the collared cows, similar to previous years.

- Calf mortality was estimated at 31% in 1988, slightly higher than in previous years but not unusual in that most calving was in the foothills where predation rates are higher.

- The Porcupine caribou herd moved into the 1002 area forming post-calving aggregations in late June and July. Large numbers of Porcupine herd caribou moved west of the Canning River in July.

- A November survey found the Porcupine caribou herd in traditional wintering areas in the Richardson and Olgilvie mountain ranges, northwestern Canada.

Muskox

- A total of 419 muskoxen were counted in the April 1988 survey, with 355 of those animals located on the Arctic Refuge. This lower population (compared to the 476 muskox counted on the refuge in 1985) is due to dispersal as muskoxen have recolonized areas to the west and east.

Tundra swan

- The nesting swan population is put at 207 with 33 nests found within the Canning River and Aichilik/Kongakut study areas in 1988. Poor weather prevented a nesting survey of the entire 1002 area.

- In 1987 the swan population was estimated to be 259, and a nesting survey of the entire 1002 area located 91 nests.

- Of 18 nests located along the Canning River delta, 78% were successful. Only 23% (3 nests) of 15 nests in the Kongakut River delta area (east of the 1002 area) were successful because of predation by a grizzly bear with cubs and by glaucous winged gulls.

Snow goose

- An estimated 49,000 snow geese were counted on the Arctic Refuge in 1988 with staging primarily occurring from September 3-22.

- In 1987 staging snow geese totaled 302,000 (16-year average is 0-325,000).

Migratory birds (coastal areas)

- Oldsquaw were the primary species observed both in the Camden Bay and Pokok Bay. Greater total bird numbers were found in the Camden Bay area, but significantly more migration activity was observed in the Pokok area.

Polar bear

- In winter of 1987/1988, three polar bear dens, and evidence of two other dens, were found within the 1002 area and one den was found on Kaktovik Inupiat Corporation lands. Three dens and evidence of another den were found on land west of the Arctic Refuge.

- To date for winter of 1988/1989, two dens have been located on the 1002 area and two on Flaxman Island, just off the northwest corner of the 1002 area.

- Land dens have been more successful than dens on pack ice with an average of 0.7 cubs produced per ice den and 1.1 cubs produced per land den.

Fisheries resources

- A draft fisheries information synthesis report from contractors has been reviewed; and a final report is expected in April 1989.

- Data were successfully gathered in the Camden Bay and Kaktovik areas on fish species distribution and abundance, as well as on temperature, salinity, and water currents. However, ice conditions interfered with similar sampling attempts in the Pokok Bluffs coastal area.

Water resources

- Eight stream gaging stations were installed and data gathered on stream discharges and temperatures.

Thlaspi arcticum

- Thlaspi arcticum plants were found over an even larger area than previously known, including several sites within the wilderness portion of the Arctic Refuge south of the 1002 area.

- A taxonomic study found that Thlaspi arcticum is a valid species and that plants known as T. cochleariforme in the Soviet Union are T. arcticum.

- Region 7 will be recommending that the species be reclassified from candidate category 2 to category 3, which would withdraw it from active consideration for formal listing under the Endangered Species Act. No further field work is necessary in 1989.

Contaminants

- Samples from the Kaktovik Inupiat Corporation exploratory well show that rehabilitation has been generally successful although there are localized areas showing signs of minor contamination.

Vegetative recovery

- Up to four years after the seismic exploration program, visibility of "cat" trails has generally decreased. However, track depressions remain and there are changes in plant composition in some vegetation types where multiple vehicle passes were made over a narrow area.

Question from Senator Wirth

Question:

Have the Minerals Management Service, the USGS, or the BLM done any further studies in ANWR or about ANWR's oil potential in the past year? Could we have the results of those studies?

Answer:

The Bureau of Land Management has been continuously updating its assessment of the oil potential of ANWR although no formal studies have been prepared since the 1002 Report. Those updates are the result of the availability of additional information such as information from the recently completed OCS Tenneco Aurora Well located approximately 10 miles east of ANWR. Since this is based on proprietary information, we could not submit it for inclusion in the Hearing Record; however, if there is a need for a briefing on this information, one could be provided as long as a suitable arrangement is made in which the confidential and proprietary information remains secure.

Question from Senator Wirth

Question: Have you read the petition sent you by environmental groups asking for reconsideration of the ANWR question by the National Academy, DOI, and DOE? Have you responded to the petition? If so, please provide us a copy of your response. If you have not responded, will you? In what time frame?

Answer: I have been advised of the content of the petition and reviewed the request to which you refer. A response will be sent within the next ten days.

Question from Senator Wirth

Question:

Mr. Secretary, the 1002 Report was drafted in 1986, and assumes oil prices will be $33/barrel in 1984 dollars in its calculations of how large a field is needed to be developable, how likely it is to find the minimum field which will be economically developable, and the economic impacts of development. Your testimony uses a DOE projection of $28/barrel (1989 dollars?) for the year 2000. Can you provide us with updated analyses taking into account changed price projections? If not, when could you?

Answer:

The 1002 analyses evaluated the impact of several oil price scenarios, with $33 as the mean price. Our estimates of revenues were based on year 2000 oil prices in the range of $20 to $40 for a barrel of North Slope oil. The analyses of those scenarios indicated that there is minimal change in the development potential of ANWR with a price of $28 versus that with a price of $33 per barrel. Since the effect on development potential would be minimal and forecasts will change in the future, we do not believe it would be prudent at this time to expend the resources necessary to complete an updated analyses.

Question from Senator Wirth

Question:

Has the Department run economic analyses which take into account changes in tax laws (particularly, the end of accelerated depreciation and changes in corporate tax rates) which were not considered in the 1002 Report analyses? Could you provide us with such analyses?

Answer:

The Department has run analyses which take into account the changes in tax laws. These were prepared for recent budget estimates. Those estimates and explanations have been provided in answer to your question on our FY 1990 budget entries.

Question from Senator Wirth

Question: What is the Department of the Interior's projection for the maximum size field (either in terms of in-place oil or recoverable reserves) which might be found in the areas offered for lease in the recent Chukchi Lease Sale?

Response: Maximum size field for areas offered for lease in Sale 109 (Chukchi) is estimated at 0.92 billion barrels recoverable. Using the ANWR recovery efficiency of 25 percent, this is 3.68 billion barrels in-place. This prospect is estimated to also contain a natural gas cap, but gas is uneconomic at this time.

Question from Senator Wirth

QUESTION: Has the Department ever officially transmitted to Congress the 60-page memo prepared by Fish and Wildlife Service personnel in the validity of the impact predictions made prior to development of the Trans-Alaska Pipeline and Prudhoe Bay fields? If not, why not?

ANSWER: This draft report, along with a cautionary memorandum from the Fish and Wildlife Service's Regional Director, and a final report, were transmitted to the House Interior Committee on June 6, 1988. A copy is enclosed.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

June 6, 1988

Honorable Morris K. Udall
Chairman, Committee on Interior
and Insular Affairs
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

Enclosed please find additional information requested at the hearing on the Arctic National Wildlife Refuge before the Subcommittee on Water and Power Resources on April 30, 1987, regarding the predicted versus actual impacts of development of the Prudhoe Bay oilfields and the TransAlaska Pipeline.

Thank you for the opportunity to provide this material to the Committee. I apologize for its delay.

Sincerely,

Philip G. Kiko
Legislative Counsel

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR, FISH AND WILDLIFE SERVICE

MAY 31 1988

Memorandum

TO: Assistant Secretary for Fish and Wildlife and Parks

FROM: Director, U.S. Fish and Wildlife Service

SUBJECT: Response to a question from Congressman George Miller regarding the predicted versus actual impacts of the development of the Prudhoe Bay oilfields and the TransAlaska Pipeline

Attached is the Fish and Wildlife Service's response to a question raised by Chairman George Miller regarding the predicted versus actual impacts of development of the Prudhoe Bay oilfields and the TransAlaska Pipeline.

This question was asked during a hearing on April 30, 1987, and reiterated in a letter from the Chairman to Secretary Hodel on May 6, 1987. An interim response was provided by the Department on August 3, 1987. I apologize that the Service was not able to provide this final response sooner.

As further requested by the Chairman in his letter of May 20, 1988, we are in the process of consolidating all the documents relevant to the preparation of this report, including notes, detailed field reports and comments from our field, Regional and Washington offices. These will be provided as soon as possible.

Attachment

PREDICTED AND ACTUAL IMPACTS OF THE DEVELOPMENT OF THE PRUDHOE BAY OILFIELDS AND THE TRANSALASKA PIPELINE

QUESTION: "... we accordingly respectfully request that the Department submit the following to the Subcommittee:

> 3. An analysis which compares predictions about the development of the Prudhoe Bay fields and the TransAlaska Pipeline System and what has transpired in terms of environmental effects and impacts on wildlife."

RESPONSE:

Table 1 sets forth the predicted and actual impacts; the impacts are defined in the same manner as in the 1002 report.

We have not attempted to provide highly specific details regarding impacts from Prudhoe Bay and the Pipeline. Extensive efforts were made in the field to prepare such specific analyses, but upon review in the Regional office it because clear that, due to frequent lack of reliable data as to the baseline conditions at Prudhoe Bay and along much of the Pipeline route prior to construction, determinations of specific impacts in many cases are highly subjective and variable. It is our feeling that, given the nature of the information, only generalized characterizations are possible. This is what we have provided in Table 1.

The overall predictability of potential impacts of oil and gas exploration and development activities on the North Slope of Alaska has improved considerably since publication of the Department's Final Environmental Impact Statement on the Proposed TransAlaska Pipeline System in 1972.

It must be kept in mind that at that date there was minimal experience in application of oilfield technology to arctic conditions, and that impact analysis itself was far less sophisticated than it is today. In addition, many of today's regulatory programs either did not exist or were not at that time in effect on the North Slope. In retrospect, it is surprising that so many of the Department's predictions were as close to reality as they were.

Nevertheless, there were impacts that were not foreseen, and others had either greater or lesser consequences than were predicted. For example, the extent of oilfield development at Prudhoe Bay was underestimated, and the extensive demands for water were not predicted.

Our ability to forecast such impacts has markedly improved since that time, reflecting both the maturing of arctic oil technology and our own extensive studies of the region, particularly on the coastal plain of the Arctic national Wildife Refuge. As reflected

in the Environmental Impact Statement for the seismic studies done on the coastal plain during the preparation of the 1002 Report, we have a high degree of confidence in our current abilities to accurately predict the impacts of any oil development that might be permitted in the Arctic Refuge.

For the seismic studies, impacts were predicted for a range of resource areas, similar to those covered by the Prudhoe Bay and TransAlaska Pipeline reports. The only impact that was not accurately predicted was the impact on vegetation. The seismic Environmental Impact Statement predicted a "Moderate" impact, while the actual impact was determined to be "Minor". Due to the knowledge of the biological resources of the coastal plain gathered during our baseline studies, we were able to manage the seismic program so as to minimize possible impacts.

An additional important aspect of our ability to minimize environmental impacts is adequate monitoring and enforcement, so that on-site professional judgments can be made, resulting in avoidance of many potential adverse impacts.

We similarly believe the predictions in the 1002 report reflect impacts that are not likely to be exceeded. For example, the extent of infrastructure development used for predictive purposes in the report could accomodate either the mean or the 5% estimates of recoverable oil reserves. Thus, unlike the situation at Prudhoe Bay, discovery of more oil than reasonably predicted would not change the likely impacts from development.

TABLE 1: Comparison of Predicted and Actual Impacts of the Prudhoe Bay oil field development and the TransAlaska Pipeline System

	Prudhoe Bay Oilfield		TransAlaska Pipeline	
RESOURCE	Estimated Impact	Actual Impact	Estimated Impact	Actual Impact
Air Quality	(NP)	Minor	Minor	Minor
Freshwater	Minor	Moderate	Moderate	Moderate
Freshwater Fish	Minor	Minor	Minor	Minor
Freshwater Invertebrates	Negligible	Minor	Minor	Minor
Vegetation	Minor	Moderate	Moderate	Moderate
Birds	Moderate	Moderate	Moderate	Moderate
Caribou	Moderate	Minor	Major	Minor
Other Large Mammals	Moderate	Minor	Moderate	Moderate
Small Animals	Minor	Minor	Minor	Minor
Marine Fish	(NP)	(ND)[1]	(NA)	(NA)
Marine Invertebrates	(NP)	Minor	(NA)	(NA)
Marine Mammals	Moderate	Negligible	Moderate	Negligible
Marine Water	Moderate	Moderate	(NA)	(NA)

NP - not predicted
ND - not determined
NA - not applicable

1/ - A 7 year study is underway on the Endicott Causeway. Preliminary data indicate impacts on marine fishes are potentially in the Moderate range.

IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

NOTE FROM THE REGIONAL DIRECTOR:

Release to the public of this DRAFT REPORT has been authorized by the Director of the U.S. Fish and Wildlife Service, in response to the high level of public interest in its contents generated by its premature distribution, which has made it a de facto public document, available only to a limited public. It must be emphasized, however, that this report is only a DRAFT document not normally released to the public because its findings have not been validated, and it is not a final document. It does not represent the conclusions of the Region, the Service, or the Department of the Interior.

Region 7 of the Service, which produced this draft, recognizes that this document may contain technical deficiencies, and considers it to be a "working document" which is still under review and revision. As such, it should not be used as a reference, nor should it construed as representative of the quality expected of final documents routinely prepared by the Service.

DRAFT

COMPARISON OF ACTUAL AND PREDICTED IMPACTS OF THE TRANS-ALASKA PIPELINE SYSTEM AND PRUDHOE BAY OILFIELDS ON THE NORTH SLOPE OF ALASKA

Prepared by

U.S. Fish and Wildlife Service
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December 1987

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Acronyms

We have largely eliminated the use of acronyms in the text, but several appear in citations and in the tables. Therefore, we are providing a list of commonly used acronyms and their meanings.

ADEC - Alaska Department of Environmental Conservation

ADF&G - Alaska Department of Fish and Game

ADNR - Alaska Department of Natural Resources

ADOT&PF - Alaska Department of Transportation and Public Facilities

AOGCC - Alaska Oil and Gas Conservation Commission

APO - Alaska Pipeline Office

ARCO - ARCO Alaska, Inc.

BLM - Bureau of Land Management

EIS - Environmental Impact Statement

EPA - United States Environmental Protection Agency

GAO - General Accounting Office

JFWAT - Joint State/Federal Fish and Wildlife Advisory Team

NPDES - National Pollutant Discharge Elimination System

SAPC - Standard Alaska Production Company

TAPS - Trans-Alaska Pipeline System

USACE - United States Army Corps of Engineers

USDI - United States Department of the Interior

USFWS - United States Fish and Wildlife Service

Physiographically, the scope of this review covers development on the "North Slope", or that part of the Alaskan Arctic north of the Brooks Range (Fig. 1). More specifically, it concentrates on the Arctic Coastal Plain to the north of the Brooks Range foothills. However, this region is neither physically nor biologically uniform, and the observed effects of development along the pipeline corridor and in the Prudhoe Bay area are not always readily extrapolated to other areas of the Arctic. This natural variation must be kept in mind when considering the physical and biological response of systems to human impacts.

The physical environment of the Arctic Coastal Plain varies considerably from east to west and north to south, and the kinds of facilities already in place within one physiographic subunit of the region will not necessarily be placed on identical terrain in the future. For example, the existing oilfields are confined almost exclusively to the flat, thaw-lake dotted portion of the coastal plain underlain by deep permafrost over marine and fluvial deposits In contrast, the eastern Arctic Coastal Plain lies in close proximity to the Brooks Range, and is characterized by stream-dissected rolling hills, a few deltaic features near the coast, and a relatively thin permafrost layer overlying bedrock. Meteorological conditions, such as summer rainfall, the amount and accumulation of winter snow, and wind speed and direction, also vary across this region, creating differing environments within which development impacts are or will be manifested.

This varying physical environment influences the biological features of the two areas; habitats, as reflected by vegetative cover, vary considerably from east to west. For example, the wet, seasonally flooded coastal plain and dominance of emergent vegetation around Prudhoe Bay contrasts sharply with the relatively well-drained wetlands and associated plant cover to the east. On the other hand, riparian woody vegetation, more abundant along rivers to the east, is relatively scarce in the west. These vegetation/habitat differences in turn affect the distribution and abundance of wildlife. As with physical environmental factors, biological differences have implications for development: facilities design, timing of activities, and the relative vulnerability of habitats and populations must all be considered when one attempts to assess or predict impacts.

III. BACKGROUND

To enable a better understanding of the basis for environmental oversight, the methods by which information has been gathered and reported, and how these have improved since preparation of the EIS, it is necessary to review the evolutionary history of environmental regulation and monitoring as it pertains to development of the Pipeline System and oilfields in the Prudhoe Bay area. It is important to recognize how regulatory involvement and information gathering have changed over the last 15 years, allowing us to "catch up" to some degree with the pace of development.

Fig. 1. Reference map of Alaska North Slope

A. Pipeline Construction

Discovery of a world class oil reservoir at Prudhoe Bay in June of 1968 culminated two decades of oil exploration on Alaska's North Slope. In June of 1969, Atlantic Richfield, Exxon, and British Petroleum, principals in a newly created pipeline consortium, filed a formal application with the Bureau of Land Management of the Department of the Interior (Department) for a trans-Alaska pipeline right-of-way between Prudhoe Bay and Valdez, Alaska.

The pace of development associated with the Prudhoe Bay oil discovery and increasing concern for potential environmental impacts led environmental groups to obtain an injunction in April of 1970, against issuance of permits to proceed without full compliance with the Environmental Impact Statement (EIS) requirements of the recently enacted National Environmental Policy Act of 1969 (Act). Ultimately, the Department was required to prepare an EIS addressing the impacts associated with construction of the Pipeline System and Prudhoe Bay oilfields. In April of 1971, the Department issued a Draft EIS, and the Final EIS was released in March of 1972. In addition, Congressional legislation under the Minerals Leasing Act was necessary before Congress could declare the Final EIS adequate under the Act, issue the right-of-way permit, and authorize construction. This was accomplished in November of 1973 with passage of the Trans-Alaska Pipeline Authorization Act, which obviated the need for further review under the Act. Construction of the Haul Road was completed in 1974, and the pipeline in 1976, with oil flow commencing in 1977.

Construction delays due to both legal and engineering considerations provided an opportunity for State and Federal agencies to begin environmental studies and develop some guidelines for agency oversight. Ad hoc Federal/State environmental coordination began with creation of an informal Interagency Fish and Wildlife Team which shared information and initiated limited biological studies along the proposed route. Eventually, it was determined that a centralized entity was needed to assure pipeline integrity, review design changes, and monitor construction and its impact on fish and wildlife. In May of 1974, a cooperative agreement between State and Federal governments resulted in formation of the Joint Fish and Wildlife Advisory Team (Team). The Team consisted of biologists from the Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the Bureau of Land Management. The Team was charged with design review, field monitoring, and advising the two pipeline surveillance agencies: the Federal Alaska Pipeline Office and the State Pipeline Coordinator's Office. Although it did not have a full range of environmental and engineering expertise, or any authority beyond that provided under State regulations, the Team was largely successful in minimizing site-specific impacts to fish and wildlife. The inadequacy of industry self-monitoring programs, and the frequency with which construction stipulations were not adhered to, forced the Team to concentrate on intensive field surveillance of existing problems, and precluded adequate follow-up monitoring (Morehouse et al. 1978).

Aside from the direct involvement of Team personnel in day-to-day pipeline construction activities, Federal regulatory oversight of environmental concerns was limited to occasional Corps of Engineers (Corps) permits related to activities in navigable waters. Under the Clean Water Act, the Corps' Section 404 program was being phased in nationally between 1974 and 1976. However, most activities in Alaska prior to 1976 were grandfathered, so it was determined that Section 404 would not apply to pipeline construction activities.

B. Oilfield Development

Although most of the Prudhoe Bay area has been developed in recent years, many facilities were in place long before pipeline construction. Between 1968 and 1971, 38 wells were drilled to explore and delineate the Sadlerochit Reservoir, and 66 miles of gravel roads, numerous pads, and three airstrips were constructed. Additional construction took place between 1971 and 1974.

Oversight by Federal and State resource agencies between 1971 and 1979 was limited by the regulatory and administrative processes available for agency involvement. Although there was some opportunity for the State to exercise its regulatory authority, this rarely occurred. Federal involvement was limited to review of occasional activities in navigable waters. Without agency involvement, initial development of the Prudhoe Bay oilfield was controlled by engineering decisions intended to maximize production and minimize cost. This resulted in significant impacts which were often avoided later when there was routine agency review of such activities (USFWS unpbl.).

In 1979, legal action by environmental groups and pressure by Federal agencies compelled the Corps to exert Section 404 jurisdiction over North Slope wetlands. In March of that year, the Corps issued two general permits covering two types of oilfield construction activities. The general permits had standardized stipulations and required applicants to obtain written authorization prior to commencement of work. These original Corps general permits were further modified into permitting processes based on the scope of proposed work: the Abbreviated Processing Procedure and individual, full-review Section 404 permits.

C. Monitoring of Operations

With the startup of the pipeline, the Joint Fish and Wildlife Advisory Team was disbanded, and Federal responsibility passed from the Alaska Pipeline Office to the Bureau of Land Management. During the early 1980's, Federal agencies began routine monitoring of activities conducted in North Slope wetlands, including virtually all oilfield activities. A process evolved which provided for formal review of development proposals. Using a wetland classification system that identified priority wetland types based on their value to migratory birds (Bergman et al. 1977), the Fish and Wildlife Service (Service) provided recommendations that mitigated some wetland and wildlife impacts through

siting, timing, and other considerations. State resource agency involvement in the regulatory process existed at the outset, although conflicting positions on some issues often developed (P. Bateman, ADEC, pers. comm.). The Alaska Division of Governmental Coordination established consolidated State review of Corps permits and consistency determinations under the Alaska Coastal Zone Management Plan. Using Federal coastal zone management funds, the State has been able to develop a more intensive and well-coordinated program of oilfield monitoring.

At present, seven federal and state resource agencies routinely participate in the regulatory process, there is a more thorough review of proposals, and project designs are more likely to include state-of-the-art mitigation measures. As monitoring of permitted activities has become more effective, greater compliance has been achieved. However, in spite of this highly structured process, there are still many projects each year which, due to a lack of planning or advance notice, receive hurried and often inadequate review.

Numerous self-monitoring programs, often required by the Corps and subject to agency review, have addressed resource concerns in the oilfields. These have included studies on the effects of road construction and traffic on wetland habitats and bird use patterns, the impacts of various oilfield activities on breeding waterfowl, development of revegetation techniques applicable to North Slope wetlands, and assessment of the effects of gravel causeways on the marine environment. In addition, the Environmental Protection Agency and the Alaska Department of Environmental Conservation have required National Ambient Air Quality monitoring programs, wastewater discharge monitoring, and related studies.

In addition to industry-funded studies required by permits, several major studies have been sponsored by the Department of Energy and National Science Foundation (Walker 1986a,b; 1987a,b) to evaluate surface alterations and their impacts on biological systems. The Service has also undertaken a series of contaminant studies related to reserve pit fluid discharges into wetlands and resulting impacts on water quality, sediments, and the biota (West and Snyder-Conn 1987; Woodward, in press; USFWS unpbl.). Other agencies have conducted more limited water quality studies. Many of these studies have suffered from a lack of adequate baseline data; in its place, control sites have been selected or models used to approximate pre-development conditions. This approach is limited by the degree of comparability of control sites within a study area and the adequacy of model assumptions. Furthermore, it has been difficult to identify causal relationships after the fact in areas affected by multiple disturbances. These uncertainties have often preserved deniability by the responsible parties.

IV. COMPARATIVE ANALYSIS

The following sections provide comparisons of facilities (predicted vs. actual) and impacts (predicted vs. actual). The analyses of facilities development and resource impacts have been separated since, in many instances, differences between predicted and actual effects are directly related to changes in the scale or design of facilities made after preparation of the EIS. The information is presented largely in tabular form to allow a more comprehensive presentation of detail and to facilitate quick reference.

A. Facilities Development

Pipeline System

In terms of the numbers of facilities and their land requirements, the Pipeline System was constructed largely as outlined in the Impact Statement. However, few predictions were specific to the North Slope section. It should also be mentioned that some design modifications were made later, when more specific engineering information was available (Morehouse et al. 1978).

The Pipeline System extends approximately 800 miles from Pump Station 1 to the Valdez Marine Terminal. The average corridor width of 2.5 miles includes the Haul Road. The North Slope segment is 145 miles, or 18% of the total Pipeline System length. The pipeline consists of 12 pump stations, 422 miles of above-ground pipeline, 345 miles of buried pipe, and 32 miles of above- and below-ground river and stream crossings (Morehouse et al. 1978). The Haul Road includes 20 permanent bridges, 1000 culverts and 135 material sites (Walker et al. 1987a). The Pipeline System was predicted to cover 39,215 acres, although the actual coverage was 33,500 acres (Pamplin 1979). However, since the estimates in the Impact Statement were based on total rights-of-way requirements, rather than actual land requirements, the actual losses exceeded the predicted losses by 935 acres (Pamplin 1979). Furthermore, while the 135 material sites needed for the section north of the Yukon were fewer than the 167 predicted, the overall acreage required was significantly higher (Table 1). For the entire development, including the section on the North Slope, material sites required the most land.

As mentioned above, certain design features were modified significantly after preparation of the Impact Statement. Permafrost limited the proportion of the North Slope section which could be buried, while requirements for free movement of large mammals necessitated a change from gravel berm-supported to pile-supported above-ground sections. Other deviations from the anticipated design resulted in both consolidation of the pipeline and Haul Road rights-of-way in some areas (e.g., Toolik and Galbraith Lake), and greater separation of the two in others (e.g., along the Sagavanirktok River).

Table 1. Summary of predicted and actual land use and facility requirements for Trans-Alaska Pipeline System (shown in acres).

Type of Use	Predicted[a]	Actual[b]	
	Entire project[c]	Entire project	North Slope only[d]
Haul road	8780[e]	4000[f]	1478
Pipeline (work pad and cleared area)	14065	10800	1949
Access roads	2770	1250	344
Camps	1190	800	148
Pump stations	703	610	121
Material sites	5760	12200	6528
Disposal sites	NP	715	49
Spur dikes	NP	400	16
Miscellaneous[g]	5037	825	267
Valdez marine terminal	910	1900	--
Total	39215	33500	10900

[a]From Trans-Alaska Pipeline System EIS. NP means facilities not predicted.
[b]From Pamplin (1979). Does not include construction since 1979.
[c]North Slope area not broken out separately in EIS.
[d]Construction section 6 (Pump Station #1 to Pump Station #4)
[e]Based on 200-ft permanent rights-of-way; not estimates of direct surface use.
[f]Direct surface impacts within 200-ft rights-of-way.
[g]Predicted includes communications sites, airfields and material storage sites. Actual includes airfields, staging areas, guidebanks, unidentified impacted areas and the Valdez marine terminal facilities located on uplands.

Oilfields

Oilfield development in the Prudhoe Bay area extends over approximately 800 square miles, a larger geographic area than the 550 square miles predicted in the Impact Statement (Fig. 2). The five reservoirs in production include three that were predicted (Prudhoe Bay, Kuparuk, and Lisburne), plus the more recent Milne Point and Endicott fields. Much of the Kuparuk and Endicott oilfield areas extend beyond the predicted limits of oilfield development.

The number of oilfield facilities and the land they covered exceeded predictions (Fig. 3, Table 2). The total area of gravel fill and extraction was 60% greater than expected, while gravel requirements surpassed predictions by 400%, necessitating expansion of gravel mining from the planned floodplain sites on the Sagavanirktok, Putuligayuk, and Kuparuk Rivers to several large gravel pits on tundra sites. The major reason for this discrepancy was that the acreage required for pads was more than three times what was expected, since individual pads averaged twice the predicted size. Nearly twice as many exploratory, delineation, and production wells were drilled and, while gathering centers were consolidated, they required larger pads. Larger pads were also required for storage pads, camps, and airfields. Finally, total road miles exceeded expectations by approximately 30%.

The most significant unpredicted facility type was the contractor service area. Many such facilities were constructed in Deadhorse, as well as at Frontier Camp and Service City (Table 2). In the Kuparuk field, a second concentrated support area was constructed (the Kuparuk Industrial Center). Other facilities not addressed in the Impact Statement included sewage and solid waste disposal sites, reserve pits, oily waste pits, docks, causeways, and seawater treatment plants.

With the development of these existing facilities, future expansion and development of new fields is assured. Development of the shallow West Sak field, which overlies much of the Kuparuk and Milne Point fields, will require closer well spacing, and therefore more pads, roads, and pipelines. Expansion into adjacent Gwydyr Bay, the Colville Delta, Seal Island (offshore), and Pt. Thomson is anticipated, since the State has unitized these fields. Thus far, nearly 4 million acres of the North Slope have been leased by the State, and this area will be doubled when proposed lease sales are added (ADNR 1987). Offshore, in the Beaufort Sea, the State has leased nearly 1 million acres, while nearly 2 million acres have been leased on the Federal Outer Continental Shelf. Exploration of these areas is continuing.

B. Resource Impacts

This section compares predicted and actual impacts of the Pipeline System and Prudhoe Bay oilfields, using the Final EIS for the overall development as a basis for comparison. However, there are limitations on

Fig. 2. Existing and predicted extent of Prudhoe Bay area oilfield development at time of EIS (1972)

Fig. 3. Actual extent of Prudhoe Bay area oilfield development (1987)

Table 2. Summary of predicted and actual land use and facility requirements for Prudhoe Bay oilfield. (NP indicates facilities not predicted in Trans-Alaska Pipeline System EIS; NQ means not quantified.)

Type of use	Predicted	Actual					
	Prudhoe Bay[a]	All Oil Fields[b]	Prudhoe Bay Unit	Lisburne	Kuparuk[c]	Milne Point[c]	Endicott[c]
All pads[d] (acres)	2135	6813	4333	230	2090(429)	147 (7)	15
Roads[e] (miles)	230	430	225	15	145 (25)	35(15)	10
(acres)	2121	2500	1267	70	850(146)	303(83)	110
Production drill pads (no.)	99	112	36	5	58 (17)	13 (5)	—[f]
(acres)	1335	3809	1000	175	1603(429)	117 (7)	—[f]
Exploratory drill pads[g] (no.)	22	81	42[h]	—	18	1	—
(acres)	190	305	210[h]	—	90	5	—[f]
Wells (no.)	700	1319	828	37	303	19	120(100)
Gathering centers[i] (no.)	31	16	10	2	3	1	1
(acres)	150	893	300	55	220	30	—[j]
Camps (no.)	3	11[k]	7[k]	—	2[k]	1	1
(acres)	100	225[k]	215[k]	—	—[k]	—[k]	—[j]
Storage pads (no.)	10	16[l]	8	—	7	—	1
(acres)	100	285[l]	200[l]	—	70	—[m]	15
Airfields (no.)	8	12	10[n]	—	2	—	—
(acres)	185	725	685	—	40	—	—
Contractor service areas (no. leases)	NP	170	169[n]	—	1	—	—
(acres)	NP	1800	1735[n]	—	65	—	—
Seawater treatment plants (no.)	NP	3	1	—	1	—	1
Marine causeways/docks (no.)	NP	4	2	—	1	—	1
(acres)	NP	512	182	—	2	—	328
Pipelines[o] (miles)	377	520	63	—[p]	418	15	20
(acres)	2284	NQ	NQ	NQ	NQ	NQ	NQ
Material sites[q] (no.)	NQ	12	5	—	5	1	1
(acres)	NQ	1720	805	—	650	35	220
(million cu. yd. gravel)	13.5	60	NQ	NQ	NQ	NQ	NQ
Sewage disposal sites (no.)	NP	12	9	—	2	1	—
Solid waste disposal sites (no.)	NP	5	4	—	1	—	—
Oily waste pits (no.)	NP	7	6	—	1	—	—
Total (acres only)	6745	11473	5782	300	3592(575)	385(90)	673

[a]From Trans-Alaska Pipeline System EIS. Production of Prudhoe Bay, Kuparuk and Lisburne Reservoirs were included.
[b]Includes existing and proposed construction (permitted but not yet built and projects presently under review) in 5 oilfields. From Walker et al. (1984) for most of Prudhoe Bay (measured); Other areas estimated from OSACE permits, ADNR (1987) and OSPVS (unpubl.).
[c]Parentheses show the portion that is proposed additions.
[d]Includes drill pads, gathering centers, camps, storage pads, airfields, and contractor service areas located onshore.
[e]Pipeline construction pads considered as roads; peat roads not included.
[f]Located on artificial offshore production islands, included under marine causeways/docks.
[g]Includes test/delineation wells; does not include offshore wells.
[h]Includes pads in Lisburne and Endicott areas.
[i]Includes power stations, gas injection and crude oil topping plants.
[j]Does not include Deadhorse facilities which are listed under contractor service areas.
[k]Includes Frontier Camp and Service City (Prudhoe Bay) and Kuparuk Industrial Center; acreage listed in contractor service areas.
[l]Facilities consolidated with gathering centers; acreages listed with gathering centers.
[m]Includes 7 exploratory airstrips averaging 5 acres each.
[n]8 ADNR leases, average 15 acres each (ADNR, pers. comm.); 71 ADOT&PF leases, average 3.7 acres each (ADOT&PF, pers. comm.).
[o]Lisburne included with Prudhoe Bay.
[p]Includes excavation and overburden placement. Some removal areas in river floodplains not included.

such a comparison, particularly for the Pipeline System, which must be taken into account when analyzing this information:

- Prior to construction, pre-project baseline information on fish, wildlife, air, and water resources of the affected area, particularly on the North Slope, was limited and qualitative in nature.

- Predictions made by the EIS were also very general and largely qualitative, reflecting the lack of specific information on the resources and environment of the region and technical uncertainties associated with such a massive construction project (Morehouse et al. 1978).

- Comparison is further limited by the lack of followup information gathered during and after construction (GAO 1981), since biological monitoring was reactive and tended to focus on site-specific correction of recurring environmental problems. There were too few personnel, too little time, and not much emphasis placed on quantification of observed impacts or gathering of detailed ecological data.

- Generalizations of actual impacts for purposes of comparison tend to mask the tremendous variability of site-specific effects related to regional topographic and biological variability, the variety of engineering practices applied, and the duration of impacts.

- There were extreme differences in training or points of view of the numerous observers and practitioners, with a concomitant lack of coordination in reporting and responding to problems, so there is no single standardized data base which can be readily summarized.

- Due largely to a lack of funding, much of the intensive monitoring conducted during and immediately after construction has been curtailed, preventing a comprehensive assessment of long-term impacts. Since many effects may only be assessed over the long term (e.g., contaminants, revegetation, wildlife population responses), this is a serious shortcoming in our knowledge of actual impacts.

Nearly all of the limitations described above also extend to development of the Prudhoe Bay Oilfield. Little baseline information was available for this area, and the U.S. Army Corps of Engineers did not extend their jurisdiction under the Clean Water Act to the North Slope until 1980, so there was little monitoring of development at Prudhoe Bay by regulatory agencies prior to this time. Thus, more than a decade of development activity had occurred in the area prior to initiation of environmental monitoring, and the severity of impacts could and continues to be estimated only through extrapolation. Furthermore, oilfield monitoring studies have been largely project-specific, and have tended to describe impacts in isolation from one another. Such methods may significantly

underestimate actual losses. As for the Pipeline System, monitoring conducted in the Prudhoe Bay area has concentrated on compliance with environmental regulations, rather than on documenting environmental effects.

One important topic that was not addressed in the EIS, and continues to elude scrutiny, is the issue of long-term, cumulative impacts. The sheer size and scope of the developments, and the complexity of ecological systems, both justify and hinder such an analysis. Assessment of cumulative impacts is required under the National Environmental Policy Act of 1969 (40 CFR, Part 1508.25(b)(7)), which states that impacts which may be individually insignificant, but significant when considered together, must be addressed. Implicit in this requirement is an understanding that the ultimate effect of many actions may exceed the sum of individual impacts, and that the effects may also be synergistic. Construction of several causeways in the marine environment is a good example of this kind of impact. In addition, when considering cumulative impacts it is necessary to anticipate the extent of development which may be stimulated by the proposed action. Development of the Pipeline System and Prudhoe Bay field made it possible to expand production to the Kuparuk and Lisburne fields, which was anticipated in the EIS, but they in turn allowed expansion to adjacent reservoirs, such as Milne Point and Endicott, which would not have been feasible without the Prudhoe Bay infrastructure. These are now making it possible to develop finds further offshore, and so on. Ultimately, development of the Arctic National Wildlife Refuge will be made possible by the presence of Prudhoe Bay and the Pipeline System.

Finally, when comparing the predicted and actual impacts of existing developments, it is necessary to consider the effect of mitigative measures applied during or after construction which may have served to reduce the net observed impacts of these projects. Most of the predictions stated in the EIS did not quantify potential reduction of impacts through avoidance, minimization, or replacement of resource values through design modifications or site rehabilitation. While many of these actions had little or no effect on the outcome, there was some net reduction of losses achieved, and it is therefore useful to indicate in this tabulation where mitigative measures have been applied and assess their degree of success. It is also important to note that the mitigative measures (e.g., stipulations or corrective actions) developed for the projects were not uniformly applied or enforced, that these measures were based on the same limited information relied upon in the EIS, and that compliance enforcement tended to focus on those problems which were most visible. Unfortunately, follow-up studies on the effectiveness of the various mitigative strategies employed has also been limited. Therefore, in assessing the relative success of mitigation measures, we have relied heavily upon the combined experience and observations of technical personnel both within the Fish and Wildlife Service and other resource agencies.

Using the various EIS predictions for each category of resources as a basis for comparison, the following table summarizes information gathered on the actual impacts to these resources and provides an assessment of the degree to which mitigative efforts have affected the outcome.

AIR QUALITY (TRANS-ALASKA PIPELINE SYSTEM)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
emissions at pump stations	-emissions of 113 lbs/hr hydrocarbons at pump stations with topping units and 15 lbs/hr at other stations -air quality standards for SO_2 not exceeded north of the Brooks Range	-no monitoring of hydrocarbon emission at North Slope pump stations; possible emissive excesses due to rumored unplanned use of pipeline to deliver 30,000 barrel/day natural gas liquids (ADEC unpbl.) -SO_2 emission levels at Pump Station 2 within performance standards (EPA unpbl.) -diverse modeling studies show probable compliance with NO_x, CO, or SO_2 standards at pump stations (EPA unpbl.)	-use of natural gas for fuel for all North Slope pump stations reduced gaseous emissions -installation of full-capacity vapor recovery system at Pump Station 1 (J. Coulta, ADEC, pers. comm.)
particulate emissions	-low probability of measurable particulates	-no monitoring of total suspended particulates at pump stations or elsewhere along TAPS	-none
dust	-unquantified dust conditions predicted	-serious impairment to visibility (M. Tinker, ADOT&PF, pers. comm.) -dust shadow to 1000 m on Haul Road (Everett 1980) -early snow melt 30-100 m -higher pH, conductivity, alkalinity in soil and water (Barbe 1980)	-road watering, road oiling ineffective, insufficient freqm -about 1/3 of Haul Road surface replaced with crushed gravel, reducing dust (M. Tinker, ADOT&PF pers. comm.) -dust palliatives effective when used recently
noise	-74 dB predicted at 600ft from pump stations, effects unknown	-no noise measurements available for pump stations or elsewhere along TAPS; no violations reported from 1985-1987 (Nathan Tibbs, Industrial Hygienist, Alaska Dept. of Labor, pers. comm.)	-none
blasting	-blasting impact on biota if conducted underwater	-temporary high dB impacts -increased sediment load in streams by blasting/moving dust, coarse material, boulders, ice -no documented impacts on aquatic biota (a. Ott, ADF&G, pers. comm.)	-timing restrictions on blasting (usually late winter) in streams/rivers effective in minimizing impacts to biota and in reducing water loss during use periods
aircraft	-helicopters and fixed-wing aircraft result in temporary noise/disturbance impacts	-as predicted, most impacts a function of aircraft altitude	-sensitive wildlife area advisories along TAPS, including timing restrictions incorporated into some construction plans -moderately effective in avoiding sensitive areas
ice fog	-some ice fog from return of wastewater to streams	-as predicted, impacts local, but sometimes hindered air operations (G.H. Zamanaty, pers. comm.) -idling vehicles an additional source of ice fog (G.H. Zamanaty, pers. comm.)	-none
pesticides	-not predicted	-unknown, but intensive spraying occurred at some camps (ADEC unpbl.)	-ADEC permits required for pesticide use -malathion use restricted at some camps -effectiveness unknown

AIR QUALITY (PRUDHOE BAY OILFIELDS) 16

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
emissions at oilfields	-measurable, but unknown emission rates at oilfield facilities	-compliance with all source performance and National Ambient Air Quality Standards for NO_x, SO_2, and CO at Prudhoe Bay and Kuparuk oilfields (Ives 1986) -one-hour O_3 standard violated during one quarter at Central Production Facility -State 6-9 hour non-methane hydrocarbon standard converted to 1979-80; standard now revealed (Ives 1986)	-monitoring requirements imposed by EPA and ADEC -numerous verbal warnings, notices violation, and compliance orders issued to oil and service companies by the State (ADEC 1987a) -for large facilities, a Best Available Control Technology Analysis required, with State review and [illegible]
particulate emissions	-none predicted for the onshore oilfields	-compliance with source performance and National ambient air quality standards on an annual basis (Ives 1986) -in 1979-80, violations of 24-hr standard noted at one of two pads (Ives 1986) -no recent data available for 24-hr standard compliance	-monitoring of flue gas combustion efficiency required by State to ensure adequate and combustion -Best Available Control Technology analysis required for equipment selection
dust	-not predicted	-dust shadow to 3-6 km (Waterflood) in Prudhoe Bay from West Road (Ives 1986) -early snow melt 30-100 m on either side of some roads and pads (greater on west side) -delayed snow melt in some cases (Everett 1982, Klinger et al. 1983)	-road watering, road oiling undersuch effective, but caused oil slicks on adjacent tundra ponds in some cases (Smith 1982)
ice fog	-unquantified ice fog predicted from wastewater return and ground water interception	-localized ice fog around most facilities	-none

FRESHWATER QUALITY AND QUANTITY (TRANS-ALASKA PIPELINE SYSTEM) 17

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
oil spills	-small spills or releases into streams and groundwater with local and very small effects on fish food organisms and primary productivity -massive spills would cover and affect large areas -maximum potential (worst case) TAPS spill limited to approximately 64,000 barrels (50,000 from pipeline rupture plus 14,000 barrels during valve closure); water spills from other sources unpredicted -general predicted impacts: •interference with respiration of aquatic organisms •coating and destruction of algae and other plankton •coating of lake beds and streams •destruction of benthic organisms •interference with spawning runs •tainting fish flavor •deoxygenation of waters -magnitude of impacts contingent on location and size of spill, weather, season, oil load, sediment load, effectiveness of containment and cleanup -unquantified adverse impacts on freshwater fishery resources	-minor spills frequent during construction, major spills less frequent (JPWAT unpbl., Kavanagh & Townsend 1977, Zamansky 1983) -accurate quantification not available on number of spills or quantities spilled (mixing records and unreported spills, spill report discrepancies and unknown volumes spilled) -major spills at many construction camps, frequently from faulty fuel lines, continued undetected for long periods with unknown spill volume and unknown magnitude of contamination of aquatic resources (JPWAT unpbl., Zamansky 1983) -two oil spills in excess of 100,000 gallons due to ruptures/leaks from fuel oil pipelines at camps (ADEC unpbl.) -pipeline leaks for long periods before detection (e.g., Arigun Pass spill, 1979) -many spills involved fuel truck accidents (ADEC unpbl.) -biological and water quality impacts resulting from major spills not studied	-prohibition of oil discharge -requirements for reporting accidental discharge (immediate notification of authorities) -oil spill contingency plans required -oil spill cleanup materials required on hand -mitigation effectiveness limited by enforcement and surveillance programs (Kavanagh & Townsend 1977, Zamansky 1983) -numerous requirements for oil pipeline integrity including welder qualification tests, lightning protection, remote shut-off valves and maintenance block valves, radiographic inspection, pressure testing, cathodic and other corrosion protection, internal pitting surveys to monitor circular deformation, and installation slip meters -insufficient requirements for construction-related spills
icing	-increase natural icing activity and/or induce new icing sites -numerous icings created in stream valleys	-predictions qualitatively accurate -observed but not quantified (JPWAT unpbl.) -natural icing phenomena difficult to separate from induced icing	-insulated pipe -burial depth requirements -effectiveness variable
erosion/ sedimentation	-structures located in streams increase turbulence and erosion, but impact negligible if mitigation applied -accelerated erosion from construction activities would increase sedimentation in streams with temporary sedimentation problem until construction area stabilized -interruption of shallow ground water by road cuts, resulting in erosion and new drainage patterns -erosion of stream banks from temporary access, but impact negligible if mitigated -some siltation at road crossings -icing areas created in rivers would induce numerous temporary diversions of surface flow and stream erosion	-erosion/sedimentation problems extensive and often serious during and immediately after construction (Morehouse et al. 1978) -most widespread and common problem during Haul Road and TAPS construction (GAO 1981, Zamansky 1983) -most erosion problems along TAPS alleviated after construction, but chronic erosion and stream sedimentation induced by inadequate stream crossing structures along Haul Road and gravel mining in floodplains persist in a few locations (JPWAT unpbl., USFWS unpbl., Elliott 1982, Woodward-Clyde 1980) -impacts were not quantified and very substantially	-minimum 300' buffer required from streams unless otherwise approved -avoidance/minimization of disturbance, revegetation required -erosion control facilities to avoid or minimize erosion -stabilization of all disturbed areas required -minimize disturbance to thermal regime -water quality standards -adequate drainage structures required -temporary access over stream banks made by use of fill ramps rather than cutting banks -fill ramps removed and disposed of as approved -effectiveness limited by enforcement and compliance effort (Morehouse et al. 1978, GAO 1981, Zamansky 1983, JPWAT unpbl.)
water quality degradation	-natural quality of stream or lake habitat impaired where construction activities add or place particulate matter (silt, organic detritus, bacteria and plankton) in suspension -construction in active riparian habitats would degrade downstream water quality through increases in suspended solids and reduction in dissolved oxygen -increased siltation and turbidity would occur during construction -generally no water quality impacts from operation of TAPS	-increased sedimentation and turbidity widespread and significant problems during and immediately after construction (GAO 1981, Berger & Swanson 1977, Zamansky 1983, Morehouse et al. 1978) -high levels of sedimentation and turbidity during and sometimes after instream construction and gravel mining (Zamansky 1983) -degree and duration of impacts highly variable, contingent on site-specific characteristics, extent of mining, mode of mining and mitigation implemented (Woodward-Clyde 1980) -long-term water impacts highly variable, but usually minor and associated with physical changes in stream (Beschta & McCart 1984)	-same as above

FRESHWATER QUALITY AND QUANTITY (TRANS-ALASKA PIPELINE SYSTEM) (Continued) 18

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
reduction in natural water flows	-loss of surface and ground water through consumptive use at camps and facilities at 60,000-80,000 gal/day per construction camp -"very small" impacts from withdrawal or return of surface water during low flow periods in immediate vicinity of some camps or stations in the Arctic, where total stream flow diverted for use -use of water for ice roads not predicted	-not quantified -very large volumes of surface and ground water used for consumption uses and construction of ice pads on North Slope (Lonsdale 1983, ADEC unpbl.)	-diversion of natural drainage, alteration of stream hydraulics, or disturbance of stream beds required specific authorizations -protection of fish spawning beds and fish passage required -pump intakes (for surface water) screened to prevent fish impact -abandoned water diversion structures plugged and stabilized to prevent fish entrapment -mitigation effectiveness highly variable
alteration of ground water flows	-interception of shallow ground water flows in some locations by road cuts or excavations, inducing greater than normal flow of ground water to surface	-not quantified, but impacts common during and after construction -impacts more serious and widespread than predicted causing water erosion/siltation problems (Lonsdale 1983, JPWAT unpbl.)	-requirements for erosion control measures and rehabilitation -alteration of natural drainage patterns prohibited unless approved -effectiveness limited by lack of construction experience in Arctic, and varied with level of enforcement (Morehouse et al. 1978)
alteration of surface flows	-not quantified -impoundment of water along Haul Road from icing of culverts -excavation and fill activities for roads and pipeline alter natural drainage channels and change flow regime of streams -impacts minor if mitigation applied	-not quantified, but problems common during and immediately after construction along Haul Road and TAPS (Burger & Swanson 1977) -problems persist along Haul Road, and lesser problems along pipeline -predicted impacts frequently caused impediments or obstacles to fish movements and snowmelt activities, fish mortalities, erosion, and sedimentation (CAO 1981, Lonsdale 1983) -over 3,200 acres in Sagavanirktok River floodplain enhanced (Pamplin 1979) -some surface flows occasionally lost or reduced due to instream gravel removal (Bombaste & McCart 1984, Elliott 1982)	-drainage facilities to pass fish and avoid siltation -site specific mitigation for activities that alter natural drainage and stream hydraulics -effectiveness limited by inadequate enforcement and compliance (Morehouse et al. 1978)
thermal effects of heated pipeline	-evaporation of soil moisture, ground water and snowmelt in vicinity of pipeline -melt water infiltration, thaw bulb around pipe, and springs forming at lower elevations -alter groundwater flow systems from thaw in permafrost and seasonal frost, induce ground water flow in pipeline trench, enlarge thaw bulb -heated pipeline will slightly increase ground water temperatures locally	-early snowmelt observed in vicinity of buried pipeline, but biological impacts not documented -not quantified, but predicted meltwater infiltration impacts occurred in some areas (JPWAT unpbl.) -at Pump Station #3, melt water flows along thaw bulb into pump station, must be pumped into Sagavanirktok River (JPWAT unpbl.) -predicted groundwater infiltration and flow changes continue to occur in some areas (Elliott 1982) -increased temperature confirmed as common occurrence, but at varying degrees along TAPS (Lonsdale 1983, Elliott 1982, Bombaste & McCart 1984) -surface flows maintained during winter in some Arctic and subarctic streams where streams freze to bottom prior to construction offering potential enhancement of overwintering habitat in thawed stream segments (ADF&G unpbl.)	-pipeline elevated in permafrost areas -burial depth requirements (often inadequate) -pipe insulation -effectiveness variable
wastewater contamination	-water locally enriched by fertilized soil leachate or sewage effluent entering ground or surface waters, possible eutrophication of small lakes -organic pollutants from human and animal wastes could enter surface and local ground water, but impacts negligible if mitigated	-some problems with wastewater effluent discharges reaching surface waters, surface discharge at nearly all camps north of Yukon River from inadequate, overloaded waste treatment facilities, which leached overflowed, or were pumped (Lonsdale 1983, ADEC unpbl.) -chronic contamination of streams, rivers and wetlands with organic pollutants from wastewater discharges (Lonsdale 1983, ADEC unpbl.), extent not quantified -localized depression of dissolved oxygen and elevated conductivity documented at several construction camps and pump stations (Lonsdale 1983, ADEC unpbl.) -increased temperature, alkalinity and suspended solids documented in receiving waters (Lonsdale 1983, ADEC unpbl.) -impacts varied considerably among locations and over time (ADEC unpbl.)	-prior approval of waste disposal systems required -waste treatment facilities sited away from streams -State water quality standards -wastewater treatment facilities poorly designed and inadequate capacity, required frequent pumping (Lonsdale 1983) -personnel often untrained -mitigation effectiveness limited by inadequate enforcement (Lonsdale 1983)

FRESHWATER WATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS)

IMPACT CATEGORY	PREDICTED BY EA/EIS	ACTUAL IMPACTS	MITIGATION
loss of natural aquatic habitat	-draining of one lake at Prudhoe Bay 0.5 mile south of Putuligayuk River	-drainage and fill of 140-acre lake for Pump Station 1 (Pamplin 1979) -approximately 12% of ponds and lakes in 3,909-acre study area filled by gravel from 1949 to 1983 in Prudhoe Bay oilfields (Walker et al. 1986a) -additional 2% of ponds/lakes subjected to indirect disturbance such as debris (Walker et al. 1986a)	-little mitigation before 1980 -avoidance, minimization recommendations generally effective in reduction of impacts since 1980
ecosystem in river floodwater and terraces	-creation of pools -diversion and entrapment of water -blockage of flow -alteration of flow regime -creation of undergravel flow rather than surface flow during low water	-numerous excavation sites in North Slope rivers left altered since, increased meander, increased capacity, and lower velocity over 3 or more years excavation (Woodward-Clyde 1980, Smith 1982) -entrapment of water in many excavation holes (Pamplin 1979)	-avoidance of active channels has been since ineffective, many active channels mined, buffer zones insufficient to avoid erosion -use of riprap and gravel-fill ramps to avoid bank cuts and rehabilitation partially effective
withdrawal of river, stream, and lake water	-not predicted	-for development, about 1.7-2.0 million gallons per well -1.3-1.5 million gallons per mile for ice roads -7-8 million gallons for construction and maintenance of each airstrip (ESEI 1987) -during operation, 36 million gallons/yr required by support service industry (ADEC unpbl.) -roughly 100-184 million gallons/yr total fresh water use for Prudhoe Bay oilfield and support services and 22 million gallons for Endicott oilfield, based on water right applications (ADNR unpbl.) -initially, water needs exceeded permitted supplies -reliable winter water sources not identified	-State Title 16 requirements prohibit impeding fish passage and degrading aquatic habitat -State encourages use of water from roadside impoundments for road watering -sufficient non-fish-bearing lakes available in Prudhoe Bay area to meet Title 16 requirements (Carl Rooming, ADF&G, pers. comm.)
withdrawal of groundwater	-negligible impact	-negligible impact due to limited usable sources -only four wells drilled in Sagavanirktok River with less than 14,700 gallons/yr removed (Baldwin 1976)	-none
tapping of river water to create reservoirs in adjacent gravel pits	-not predicted	-Kuparuk and Sagavanirktok Rivers tapped both accidentally and purposely; 191 surface acres of "reservoirs" created with more than 5.3×10^{14} gallons of river water (ADF&G Notice of Violation dated June 18, 1984; ADF&G unpbl.)	-State and Federal agencies currently negotiating with oil industry to enhance gravel pit reservoirs for fish and birds -mitigation effectiveness unknown until projects implemented
flooding/ impoundment of water by roads, pads, snowbanks	-no quantitive predictions -predicted impacts include blockage, diversion of flow due to inadequate culverting, frozen culverts, culvert failure, etc.	-3,412 terrestrial acres flooded in Prudhoe Bay as of 1983 (Walker et al. 1984b) -in cases of deep water, reduced productivity -in cases of shallow flooding, increased productivity (Walker et al. 1986a)	-properly placed and sized culverts usually effective, but chronic history of poorly placed, inadequately sized, iced culverts with numerous documented cases of blocked flow and permanently impounded waters (ADEC et al. 1984-1987)
discharge of excess water from excavations	-not predicted	-1984-1986, about 736 million gallons of water discharged to lakes, ponds, streams and tundra from dewatering of gravel pits, trenches, impoundments (ADEC 1987a) -impacts on water quality unknown -rich salt content to water of certain pits (Chatriz 1987; Carl Rooming, ADF&G, pers. comm.)	-general effluent restrictions on hydrocarbons, garbage, contaminants in State Excavation Dewatering Permit, but no applicable monitoring requirements for discharge to surface water except for solids
contamination of surface water by reserve pit fluids	-not predicted	-discharge of 47-101 million gallons/yr reserve pit fluids directly to tundra (ADEC 1987c) -contamination of some tundra ponds, lakes by metals and/or hydrocarbons through seepage, breaching and direct discharge to tundra, ponds, and pads (West & Snyder-Conn 1987, Woodward in press) -violations of State wastewater discharge/EPA water quality criteria common from 1983-1986 (ADEC unpbl.) -seepage through pit walls documented at 17 reserve pits (ADEC unpbl.)	-State Wastewater Discharge Permit required in 1983 -road/pad discharge permit instituted in 1985 (ADEC 1987c) -since initial permits, increased chemical characterization, pre- and post-monitoring requirements added to permits -early spring dewatering permit added in 1987 to facilitate discharge of early coolwater -snow/liquid management reduced need to dewater -above measures more effective in reducing contamination -seepage remains a problem (ADEC unpbl.)

FRESHWATER QUALITY AND QUANTITY (PRIMROSE BAY OILFIELDS) (Continued) 20

IMPACT CATEGORY	PREDICTED BY EAPE EIS	ACTUAL IMPACTS	MITIGATION
sewage	-not predicted	-excluding drill rig camps, 6 minor and 6 major sewage treatment facilities/lagoons, 3 of which discharge into natural lakes (USEPA unpubl.) -total discharge under 41 permits allow up to 1 million gallons per day (ADEC 1987a) -receiving lakes eutrophic (USEPA unpubl.) -enrichment of roadside ponds from sewage sludge disposal on roads likely, 683,000 gallons in 1986, (ADEC 1987a)	-secondary or tertiary treatment undersized; effective according to ADEC monthly reporting -sludge generally disposed by incineration -facilities enhanced bird use, other mitigation not sought -some non-compliance by discharge of poor quality effluent, breaches of lagoon dikes, etc. (ADEC 1987a)
produced water	-not predicted	-by 1991, more than 15.8 billion gallons injected for disposal or waterflooding (ADOGC 1987) -only one highly local brine spill documented, none to surface water -groundwater already poor quality (high total dissolved solids) so impacts negligible	-injection below permafrost strata required and highly effective
hazardous, non-hazardous, and RCRA- exempt oilfield wastes	-not predicted, except hydrocarbons	-most of average 7 million gallons waste per year (ADEC 1987a) successfully injected below permafrost barrier -several small surface spills, leaks from hoses, tanker truck spills (ADEC 1987a) -water quality degradation not monitored or quantified -since 1985, hazardous wastes not accepted for intertie from service support industries, increasing possibility of illegal discharge to surface waters (ADEC unpubl.)	-tank storage required and usually used -water quality impacts/ cleanups not documented -truck rinsate probably important source of contamination of surface water but impact local, often to impoundments
oil spills plus glycol, methanol	-not quantified -number of small spills in oilfields during construction -no specific predictions on large spills	-yearly statistics on oil spills poor -for EAPE and oilfields in 1983-86, 913 reported spills including 84 spills of more than 500 gallons and 27 spills of more than 1,000 gallons, mostly of crude and diesel oil and mostly in oilfields (ADEC 1987b; ADEC unpubl.) -amounts of spills/impacts to surface water not quantified -oil entered surface waters from reserve pit discharges (West & Barker-Cone 1987; Woodward in press) and from oil spills near East Dock reserve pits (USEPA unpubl., EAPC 1986) and at Stockstrom Point (Bergman et al. 1977) -Stockstrom Point spill destroyed plant and invertebrate life and contaminated water and sediment -other chronic spills caused silkie to Sagavanirktok River (ADEC unpubl.) -use of oil on roads contaminated adjacent tundra ponds (Smith 1982) -impacts not studied, but recovery slow based on experimental spills to Arctic ponds (Hurlbutt et al. 1980)	-oil spill contingency plans -rapid reporting/cleanup requirements -formation of oil-industry sponsored oil cleanup company based in Prudhoe Bay -mitigation moderately effective to oil industry spills, but ineffective in case of service industry, where failure to report/cleanup spills common (ADEC 1987a, ADEC unpubl.)
erosion/ sedimentation	-not quantified -siltation and sedimentation from erosion during construction	-not predicted, but not quantified on area-wide basis -snow removing road treatments cause annual siltation/ sedimentation/gravel encroaching episodes (e.g., Kuparuk River bridge) -additional serious siltation from poor siting of overburden material at gravel excavation sites (ADEC et al. 1984-1987) -serious erosion/sedimentation problems from active excavation of stream/river channels (see excavation impact category)(Woodward-Clyde 1980)	-riparian/erosion protection measures required at stream and river crossings -seasonal restrictions on construction -State enforcement of siltation for activities in anadromous fish streams -mitigation effectiveness dependent on location, enforcement, compliance

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
Discharge of drilling effluents	-not predicted	-Endicott development first offshore production facility -approximately 120,000 cu yd of materials to be discharged from 120 wells (USACE 1984) -suspended effluent to cover up to 5,730 acres of sea floor (USACE 1984) -some effect expected on benthos -potential for contaminants effects (heavy metals)	-standard NPDES offshore stipulations on composition and rates of discharge -additional conditions on location and timing of discharge -effectiveness not yet assessed
oil spills	-possibility of spill reaching Beaufort Sea via estuaries, but probabilities not predicted	-no major offshore spill to date from Endicott development or any exploration wells -numerous unquantified minor spills, no effects not measured (USFWS suppl.)	-development of oil spill contingency plans
discharge of sea water treatment chemicals	-not predicted	-addition of seawater intakes and treatment plants at Prudhoe Bay and Oliktok Point (Kuparuk field) for secondary oil recovery requires discharge of treatment chemicals into marine environment -total discharge of 9 million gallons/day (includes up to 170,000 lbs of solids/day (EPA suppl.) -chemicals are largely chlorine reaction products (organochlorides), coagulants, and clarifiers -elevated levels of such chemicals in water column and detectable changes in density and diversity of benthic infauna near plants (NORTEC 1986)	-NPDES stipulations on composition, rates, and timing of discharges -effectiveness not yet assessed
alteration of oceanographic conditions	-not predicted	-West Dock and Endicott causeways altered oceanographic conditions (temperature and salinity) over thousands of acres in nearshore zone (Environsphere 1987, Gilbertson et al. 1987) -depending upon wind conditions and freshwater input, temperatures and salinities may diverge 4-6°C and 10-20ppt respectively across West Dock causeway (Environsphere 1987) -effects of Endicott causeway not yet assessed, but expected to be more extensive (Gilbertson et al. 1987) -oceanographic conditions important component of anadromous fish habitat, since they alter prey abundance and fish physiological requirements (Environsphere 1987)	-causeway breaching (primarily for fish passage) has resulted in minimal effectiveness (Hamilton et al. 1986)

FRESHWATER INVERTEBRATES (TRANS-ALASKA PIPELINE SYSTEM)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
erosion/ sedimentation	-reduced total productivity -reduction of benthic organisms	-not studied during construction when erosion/ sedimentation effects most significant -post-construction studies in a few stream found impacts highly variable, ranging from insignificant impacts to decreased standing crop and taxonomic diversity (Woodward-Clyde 1980) -in general high gradient, mountain streams less impacted than lower gradient, productive streams (Beaucte & McCart 1984) -in Sagavanirktok River tributary, increased densities of most taxa in river sections impacted by previous gravel mining, as compared to control sites (Woodward-Clyde 1980) -in Esperok River, gravel mining decreased densities of all taxa (Woodward-Clyde 1980) -impacts highly variable, but in general, impact on benthic invertebrate communities more significant in stable tributary streams than in large braided streams (Beaucte & McCart 1984)	-See FRESHWATER QUALITY AND QUANTITY (TAPS)
oil spill	-see oil spill impacts under FRESHWATER QUALITY AND QUANTITY (TAPS) -impacts contingent on magnitude and duration of spill and other variables	-overall reduction of aquatic organisms (Hoffman & Kernodle 1975) -reduced numbers of benthic invertebrates in all taxonomic groups at one North Slope study site (Hoffman & Kernodle 1975) -impacts at other oil spill locations not studied	-see FRESHWATER QUALITY AND QUANTITY (TAPS)
thermal effects of heated pipeline buried in streams or rivers	-increased productivity	-not studied	-see FRESHWATER QUALITY AND QUANTITY (TAPS)

FRESHWATER INVERTEBRATES (PRUDHOE BAY OILFIELDS)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
contamination from reserve pit fluid discharges, seepages, etc.	-not predicted	-1982 study found decreased taxonomic diversity and abundance of most invertebrates within 375 ft of drill pad effluent discharge/seepage sites with predominance of chironomids in ponds adjacent to reserve pits, indicating contamination (West & Snyder-Conn 1987) -chronic and subacute toxicity of certain reserve pit fluids demonstrated, even when diluted (Woodward in press)	- State wastewater discharge regulations applied to reserve pit fluids in 1983 and strengthened in subsequent years - mitigation effectiveness for invertebrates not studied, but water quality improvements noticed (BSPWS emph.)
oil spills/oily waste discharges	-localized toxic response by invertebrates depending on timing, volume, flushing	-most discharges from dilute reserve pit fluids and contaminated snow bulldozed from pads -some slicks from road oiling (Smith 1982) -loss of crustaceans in tundra ponds statistically correlated with aromatic hydrocarbon concentrations (West & Snyder-Conn 1987) -total loss of pond invertebrates observed from one spill (Bergman et al. 1977)	- see above and FRESHWATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS)
sedimentation/ turbidity	-local losses/burial of aquatic invertebrates	-probably as predicted, but not studied or quantified	- see FRESHWATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS)

MARINE INVERTEBRATES (PROVINCE BAY OFFSHORE)

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IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
direct loss of invertebrate informe and/or habitat	-not predicted	-total seafloor covered by gravel fill or dredged during causeway construction: Boat Basin: 180 acres Endicott: 370 TOTAL LOSSES: 550 acres	-none
alteration of nearshore aquatic habitat	-not predicted	-not quantified -alteration of oceanographic conditions (temperature and salinity) caused localized shifts in abundance of marine epibenthic invertebrates (Envirosphere 1987)	-none
alteration of benthic habitat	-not predicted	-not specific -in general, conditions in immediate vicinity of causeway (oceanography and sediments) sufficiently altered to cause changes in benthic community diversity and relative abundance (Envirosphere 1987, BEBTAC 1987) -long-term implications not yet assessed	-none
discharge of drilling fluids	-not predicted	-not quantified -Endicott development first to discharge large quantities of drilling fluids into marine environment -only 1 year of drilling so far, too early to detect impacts (BEBTAC 1987) -some changes in benthic communities expected -potential for bioaccumulation of contaminants (heavy metals and hydrocarbons) in prey species (amphipods to anadromous fish and waterfowl, but not studied	-standard NPDES restrictions -discharge to be confined to source (causeway) side of drill-sites, flow rate restricted, and oil materials to be discharged concentrate at least 1,000 m from sensitive benthic communities -extensive monitoring requirements -effectiveness not yet assessed, some loss of confidence
entrainment in seawater intakes	-not predicted	-13-30% mortality of entrained invertebrates (Dames & Moore 1986, 1987) -no measurable effects on species' abundance	-Marine Life Return System (proposed) reduced mortality 70 to 85% (Dames & Moore 1986, 1987)
discharge of seawater treatment effluents	-not predicted	-not quantified -measurable decline in infaunal abundance within sliding zone for blast discharges usually correlated with water quality changes (BEBTAC 1986)	-NPDES restrictions on discharge rates

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
Habitat modifications	-not predicted	-impacts extensive but not quantified -in construction section 4 (Pump Station 4 to Prudhoe Bay) 1,315 acres vegetated and 5,038 acres unvegetated floodplain impacted by construction activities, as of July 1978; substantial but unquantified acreage of riparian habitat otherwise modified; above acreage impacts do not include aquatic habitat impacts (Pamplin 1979) -extensive sedimentation of substrate within mined areas and downstream of construction activities -increased unstable substrate common, but changes in substrate vary with characteristics of stream and mining practices (Woodward-Clyde 1980) -loss of bed relief (regularization and uniformity of bed) -loss of instream cover and alteration of stream flow (Woodward-Clyde 1980) -reduction of habitat diversity in material sites where gravel deposits occupied below water line (Woodward-Clyde 1980, Dunbeats and McCart 1984) -alteration to channel cross sections with increased wetted perimeters and shallower, more uniform depths (increased braiding), where gravel occupied over large areas (Woodward-Clyde 1980) -increased habitat in a few instances where material site excavation tapped into ground water (Woodward-Clyde 1980, Elliott 1982, Dunbeats and McCart 1984) -increased unstable substrate	-erosion control required -buffer strips -fish passage requirements -stabilization of disturbed streams -rehabilitation, revegetation of disturbed areas -avoid channel changes in fish spawning beds -prior mining plan and design approvals (Berger & Dorrance 1977) -mitigation only partially effective due to inadequate enforcement and irregular application (JPEAT unpbl., Lamonte 1983, Morehouse et al. 1978)
Habitat loss	-not predicted	-localized reduction, and in some cases, loss of surface flow (Elliott 1982, Dunbeats and McCart 1984) -alteration of numerous stream meanders with resultant habitat loss in many locations, but magnitude of loss not quantified (JPEAT unpbl.) -numerous fish blockages along haul road, which eliminate fish use of upstream aquatic habitat by all fish or certain species and/or certain age/size classes of fish (Elliott 1982, JPEAT unpbl., ADF&G unpbl.)	-see above
Fish mortality	-mortality of salmonid eggs and embryos	-various levels of fish mortalities along several streams resulting from fish entrapment upstream of areas where surface flows lost to permeable substrate caused by instream mining and stream flow interception by pipeline trench and/or thaw bulb (Elliott 1982) -fish entrapment occurs during low flow periods when fish attempt emigration to wintering areas (Elliott 1982) -in one case, an estimated 3,000 fish entrapped due to loss of surface flows resulting from gravel removal from stream (ADF&G unpbl.) -instream gravel removal in one Atigun River tributary caused disconnuous surface flows in late summer and stranded estimated 75% of peak summer resident Arctic grayling population (Elliott 1982) -fish mortalities from increased stress under winter conditions caused by very high sedimentation (compounded anlike) from upstream construction (buried pipe crossing) but extent of such impacts not studied (EPA unpbl.) -localized impacts possibly significant, but overall impacts on regional fish populations not quantified -in 1978, several thousand Arctic grayling unable to swim downstream through outwash gravel barrier (ADF&G unpbl.) -fish egg and embryo mortality likely, but not studied	-see above -screened pump intakes -abandoned diversions plugged and stabilized -fish bypass structures -mitigation effectiveness limited by enforcement problems (Morehouse et al. 1978, JPEAT unpbl.)
Changes to species composition	-not predicted, except as minor effects from thermal changes	-carrying capacity depending on species present, location, time and scope of mining operations, and time since disturbance (Woodward-Clyde 1980)	-see habitat modification above

FRESHWATER FISH (TRANS-ALASKA PIPELINE SYSTEM)(Continued)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
Changes in fish densities or distributions	-reduction in total productivity	-effects on fish densities not quantified, but probably variable and localized -very low fish use documented in channelized section of some streams (Elliott 1982) -fish densities averaged 1.7 times higher in undisturbed stretch than in gravel mined stretch of one stream (Elliott 1982) -in Sagavanirktok River, large areas of floodplain scraped for gravel, increased Arctic grayling, reduced round whitefish, loss of Arctic char habitat (Woodward-Clyde 1980) -in similar situations elsewhere, Arctic grayling decreased (Woodward-Clyde 1980) -in Kuparuk River, reduced diversity and early age classes of Arctic grayling (Woodward-Clyde 1980) -in some situations, creation of overwintering habitat and increased habitat diversity probably resulted in localized increases in fish densities (Woodward-Clyde 1980)	-see above
erosion and siltation	-reduced total productivity -reduced fish food organisms	-unquantified fish mortality downstream from winter instream construction probably the result of high sediment loads (EPA unpbl.) -siltation of fish spawning areas common and impacts on fisheries productivity very likely but not quantified -heavy sedimentation from construction and subsequent repair and maintenance activities known to cause abrasion of gill tissues, loss of fish food organisms, inability to feed, loss of primary productivity, decrease in substrate quality, avoidance, and increased stress on fish, but magnitude of impacts not quantified	-avoid construction in/or near streambeds -erosion control measures -temporary fill ramps to access streams -mitigation effectiveness limited by poor enforcement and inadequate Arctic engineering experience (JPO&T unpbl.) -bridges and riprap for stabilization, stilling basins
blockages or interference with fish passage	-fish passage problems negligible, if mitigation applied	-one of most common and extensive problems during and after construction (Buckhouse et al. 1978, Berger & Swanson 1977) -problem still persists, particularly along Haul Road (ADF&G unpbl.) -various levels of fish mortalities at many North Slope streams from fish entrapment above fish blockages during fall emigrations (Elliott 1982, Deublanco & McCart 1984) -fish entrapment in deep mined pits, left near streams and rivers (Woodward-Clyde 1980, JPO&T unpbl.) -upstream migration of spawners blocked by inadequate stream crossing facilities and icing problems (JPO&T unpbl.) -impacts on fish productivity and population levels not quantified -significant reductions in available fish habitat (Elliott 1982)	-prohibit use of artificial structures or stream channel changes that trap or block fish -require fish passage structures when channel altered or blocked -construction timing restrictions on 20 anadromous fish streams to avoid fish runs -mitigation effectiveness limited by poor enforcement and inadequate Arctic engineering experience
fish harvest	-access would increase harvest of fish resources north of Yukon River -diminish quality wilderness fishing opportunities -reduce size and rate of catch	-increased fishing pressure observed but not unquantified (ADF&G unpbl.)	-Haul Road corridor closed to fishing during construction -increased fishing pressure when fishing closures lifted after construction
oil spill	-see FRESHWATER QUALITY AND QUANTITY (TAPS) -death of fish embryos or young through deoxygenation or loss of fish food, could cause negligible impacts unless large spill or in location of spawning run	impacts not quantified -reduction in standing crop and diversity of aquatic fish food organisms documented in areas affected by spills (see FRESHWATER INVERTEBRATES - TAPS)	-see FRESHWATER QUALITY AND QUANTITY (TAPS)
thermal effects of pipeline buried under rivers or streams	-biological adjustments in life histories of bottom dwelling fish and associated organisms may cause changes in species composition	-fall fish emigration blocked in Atigun River headwaters by surface flow lost to pipeline (Elliott 1982) -fish attracted to warm waters created by pipeline trapped and died as stream froze (Elliott 1982) -possible enhancement of overwintering conditions, but not studied	-see FRESHWATER QUALITY AND QUANTITY (TAPS)

FRESHWATER FISH (PRUDHOE BAY OILFIELDS) 26

IMPACT CATEGORY	PREDICTED BY EAPS EIS	ACTUAL IMPACTS	MITIGATION
erosion and siltation from pipeline and road construction	-all pipeline and road crossings of streams may cause erosion and siltation *effects temporary, maximum of 2 years *siltation impact most severe in river deltas and marine areas -stream substrate alteration may cause moderate siltation with short term impacts or 2 years or less	-fieldwide impacts from erosion and siltation caused by construction of roads, pipelines and pads (ADF&G, USFWS unpbl.) -alteration of stream hydrology (ADF&G, USFWS unpbl.) -blockages to fish movement (ADF&G, USFWS unpbl.) -loss of spawning, rearing and feeding habitat from above impacts (ADF&G, USFWS unpbl.) -erosion of gravel into streams often resulted in permanent impact (USFWS unpbl.) -streams with vegetated substrate covered with gravel, long-term effect (USFWS unpbl.) -winter instream activity increased turbidity upstream of overwintering areas resulting in impacts to overwintering fish (ADF&G unpbl.) -loss of fish spawning, rearing and feeding habitat (grayling, stickleback, sculpin)(Craig and Poulin 1975) -impacts unquantified	-road culverts designed for peak flows at all stream crossings -design often inadequate, large percentage of road/stream crossings annually washed out (ADF&G, USFWS unpbl.)
thermal erosion of stream banks and beds	-not predicted for oilfield activities	-stream channel configuration and hydrology altered by thermal erosion caused by gravel mining (ADF&G, USFWS unpbl.) -stream flow captured by thermokarst action (ADF&G, USFWS unpbl.)	-after-the-fact mitigation used to retard or stop erosion by covering thermally eroded soils -some cases of thermal erosion continue despite attempts to rest (McClelland-EBA 1985)
instream barriers to fish movements from road and pipeline crossing construction	-adequate culvert design and construction stipulations would eliminate impacts	-extensive fish blockages (ADF&G unpbl.) -in Kuparuk field all fish streams totally or partially blocked in at least one location during low summer flows (ADF&G unpbl.	-culverts designed for peak flows, however designs often inadequate for breakup flows (ADF&G, USFWS unpbl.)
oil spills to fish streams	-see FRESHWATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS)		
contaminants released to aquatic systems	-see FRESHWATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS)		
fish stock reduction	-improved access would increase harvest and reduce fish stocks, impact not quantified	-fish stocks believed to be reduced, but inadequately studied (ADF&G unpbl.) -impact not quantified	-none applied
stream blockage from ice formation	-icing predicted but not as potential direct impact to fishery resources	-blockages to spring movement of grayling (Woodward-Clyde 1980) -loss of spawning habitat (Woodward-Clyde 1980) -delayed spawning movements (Woodward-Clyde 1980) -quantity of habitat affected not assessed	-culvert design used that prevents icing -mechanical removal of ice blockages -when problems predicted or anticipated, action can be effective
siltation from gravel mining	-short-term siltation increase during normal flows -longer term increase during high flows	-siltation increase generally of short duration (Woodward-Clyde 1980) -reduced primary productivity in streams (Woodward-Clyde 1980) -alteration of substrate with impact to spawning and feeding habitat (Woodward-Clyde 1980)	-timing restriction for instream activity to avoid presence of fish
altered stream hydrology	-changes in stream hydrology resulting in habitat alteration	-extensive areas in lower Sagavanirktok and Kuparuk rivers altered from gravel mining to river, (Woodward-Clyde 1980)resulting in *unstable substrate *braiding of channels *channel blockages *increased Arctic grayling numbers, reduced round whitefish, loss of Arctic char habitat, fish stranding -in Kuparuk River, mining reduced number of fish species and life history stages and caused fish entrapments (Woodard-Clyde 1980)	-seasonal restrictions for instream activities -buffers from active parts of channels -mitigation effective, but not always applied or enforced

FRESHWATER FISH (PRUDHOE BAY OILFIELDS) (Continued)

IMPACT CATEGORY	PREDICTED BY TAPS KIT	ACTUAL IMPACTS	MITIGATION
impacts to fish overwintering	-stress impacts to overwintering fish from changes in water quality caused by instream activities	-gravel extraction and installation of pipelines in stream during winter caused elevated turbidity levels (ADF&G unpbl.) -extent of impact not documented	-timing restrictions partially effective
winter water withdrawal from rivers	-impact would be minimal or some loss to stream protection regulations	-impacts to overwintering fish occurred, extent not documented (ADF&G unpbl.) -total water use of oilfield operations estimated at 132-206 million gal/year (ADF&G unpbl.) -total water withdrawals from river years to date, for all oilfield operations were about 5.5 x 10^{10} gallons -see FRESHWATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS) for a quantification of water withdrawals	-since 1982, use of reservoirs as water sources reduced need for water from natural ponds and streams -need more baseline information regarding flow resources of water bodies to assess potential impacts of water withdrawals

MARINE FISH (PRUDHOE BAY OILFIELDS)

IMPACT CATEGORY	PREDICTED BY TAPS KIT	ACTUAL IMPACTS	MITIGATION
oil spills	-where fish come into direct contact with spilled hydrocarbons, high mortality expected -degree of impact dependent upon quantities spilled, time of year, and proximity to fish concentrations -up to 50,000 bbl expected to be spilled during a single pipeline spill, but impacts to fish populations not predicted	-not quantified -numerous small spills of non-pipeline hydrocarbons, (USFWS unpbl.) but impacts to anadromous fish populations in streams or the marine environment not documented	-development of oil spill contingency plans
alteration of nearshore habitat	-not predicted	-expansion of existing facilities and development of adjacent reservoirs required construction of gravel-fill causeways perpendicular to shoreline (USACE 1980, 1984) -causeways altered water quality (temperature and salinity) by altering distribution of brackish water and invertebrate prey in nearshore zone, and thus extent and quality of summer feeding habitat (Environsphere 1987) -extension of West Dock causeway for docking and location of seawater intake and treatment plant detrimentally altered approximately 67,000 acres of nearshore aquatic habitat (Environsphere 1987) -studies indicate similar habitat impacts resulting from presence of Endicott causeway (Gilbertson et al. 1987) -cumulative impact of both causeways on marine habitat not yet quantified	-small breaches in causeways to permit fish passage expected to have some beneficial effect on habitat continuity (USACE 1980, 1984) -breaches at West Dock have not mitigated habitat losses or improved fish passage (Environsphere 1987) -insufficient information from ongoing Endicott causeway monitoring studies to assess mitigation effectiveness
interruption of nearshore fish movement	-not predicted	-presence of causeways described above and their effect on habitat continuity interrupts or delays summer longshore movements of anadromous fish (cisco, whitefish, and char) in nearshore brackish water zone (Environsphere 1987) -this effect believed to limit feeding and delay returns to overwintering sites in major coastal rivers (Environsphere 1987) -total impact of both causeways on migration not yet quantified	-breaching minimally effective (generally less than 10% efficiency) at West Dock (Hamilton et al. 1984) -insufficient information from ongoing Endicott causeway monitoring studies to assess mitigation effectiveness
entrainment in seawater intakes	-not predicted	-two seawater intakes (West Dock and Oliktok) supply water for secondary recovery of oil -third (Endicott) under construction -monitoring of West Dock intake indicates approximately one million larval fish (marine and anadromous) are entrained annually with mortality up to 40% (Barnes & Moore 1984)	-Marine Life Return System (bypass) minimizes losses of larger fish (greater than 100 mm) -low intake flow rates to reduce entrainment

VEGETATION (TRANS-ALASKA PIPELINE SYSTEM)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
direct loss by removal or fill	-39,115ac total -11,600ac for North Slope (estimated)	-33,300ac total (Pamplin 1979) -10,900ac for North Slope (measured)	-revegetation with introduced grasses over approximately 7,000ac -grass cover generally less than 40% and declining 3-5 years after seeding; reinvasion by native species only on lowland sites (Native Plants 1980) -upland material sites and wetlands remain largely unvegetated 10-12 years after abandonment (Native Plants 1980) -revegetation efforts with native woody plants on North Slope riparian habitats ineffective (Densmore et al. 1987)
thermokarst	-expected, but not quantified	-not quantified -common occurrence where surface temperature disturbed by variety of effects (compression of vegetative cover, dust, impoundments, etc.; Walker et al. 1987a) -usual effects observed range from alteration of species composition to total loss by deep flooding	-none; vegetation lost where soil temperatures stabilized by fill to prevent engineering problems
impoundments (drainage alteration)	-expected, but not quantified	-not quantified -observed effects of flooding range from changes in species composition to total loss of plant community (Walker et al. 1987a) -problem compounded by thermokarst effects	-facilities siting to avoid alteration of surface flow -culverts to improve drainage -culvert maintenance during operational phase -mitigation generally successful where surface flow well-defined
erosion/redeposition of exposed soil or fill	-expected, but not quantified	-not quantified -some of direct disturbance expanded by runoff/outwash from roads, pads, and material sites -snow removal practices also contribute to spread of gravel fill	-construction/maintenance of drainage channels -surface stabilization through revegetation ineffective -erosion control usually achieved by physical means
dust	-not predicted	-dust deposition up to 5kg/m^2 within 0m of Haul Road (Brown & Berg 1980) -dust effects up to 1000m from road (Walker et al. 1987a) -total loss of vegetation less than 0m from road -alteration of species composition, soil texture and pH, and snowmelt patterns up to 1000m from road (Brown & Berg 1980)	-periodic road watering ineffective
icing	-expected, but not quantified	-not quantified -some alteration of stream/flow and streambed led to perennial icing and loss of riparian vegetation (Pamplin 1979)	-none (some natural reestabilization of stream courses)
snow accumulation	-not predicted	-trapping of windblown snow by elevated structures and accumulation from snow removal cause late-lying snowbeds adjacent to facilities (USFWS unpbl.) -ultimately leads to localized changes in plant species composition, lowered productivity	-none
oil spills	-probability of pipeline oil spill not predicted; for any possible leak, an estimated 64,000 bbl would be discharged onto adjacent vegetation; total mortality expected from direct exposure; 25,000 bbl spill expected to affect 6.6 level acres	-not quantified for entire North Slope -total of 16,000 spills occurred along TAPS between 1974 and 1977 (933 in 1983-84, including 96 greater than 500 gal.) which presumably led to vegetation losses (ADEC 1987b) -effects of spill cleanup efforts often exacerbate effects of oil on vegetation -one 1,300 bbl spill covered 71 level acres, or 3 times predicted due to high line pressure (Walker et al. 1987a) -a second 1,300 bbl spill reached a major stream, extended 13-25 miles downstream, killing riparian vegetation (AFO 1979, USFWS unpbl.)	-none -in summer, spill cleanup efforts generally increase impacts to vegetation

VEGETATION (TRANS-ALASKA PIPELINE SYSTEM)(Continued)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
ORV use (public)	-significant impacts to North Slope if public access permitted, few if access restricted -plant death, compression of vegetative mat would lead to thermokarst erosion, alteration of species composition	-not quantified -little measurable impact	-restricted public access to North Slope largely successful while enforced
spread of intro-duced weeds	-not predicted	-enhanced migration along transportation corridor on [illegible] contaminated revegetation materials (Eubanks 1980)	-none
SO_2 emissions (from pump stations)	-possible localized impacts to some plant species (e.g., lichens)	-none measured	-none

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
direct loss by removal or fill	-total of 6,749 acres for development of Prudhoe Bay, Kuparuk, and Lisburne fields -Miles Point, Endicott and other proposed additions not predicted	-Prudhoe Bay: 6,405 acres (Table 2) Kuparuk: 3,817 Lisburne: 300 Miles Pt.: 295 Endicott: 345 Proposed Additions: 665 TOTAL LOSSES: 11,027 acres	-facilities consolidation only partially achievable due to engineering considerations (USFWS unpbl.) -siting to reduce loss of "high value" vegetation types did not reduce net losses of vegetation
thermokarst	-expected, but not quantified	-intensively studied areas of thaw adjacent to roads and pads included approximately 200 acres of thermokarst disturbance directly related to approximately 300 acres of roads and pads (40% increase in affected area; Walker et al. 1987b)	-none
impoundments (drainage alteration)	-expected, but not quantified	-in the Prudhoe Bay field, approximately 5,200 acres of gravel fill structures created approximately 3,450 acres of flooded tundra (44% increase in affected area; impacts to vegetation not quantified, but presumably ranged from alteration of plant species composition to total loss of plant cover (Walker et al. 1984, 1987b)	-facilities siting -culvert placement and maintenance successful only where surface flow well defined (usually not) -more successful culverting in Kuparuk than Prudhoe Bay
erosion/redeposition of fill	-not predicted	-not quantified -some of direct disturbance and loss of vegetation exposed by erosion, road maintenance, and snow removal (USFWS unpbl.)	-snow removal plans reduced area of impact from snow removal operations
dust	-not predicted	-along heavily traveled roads all vegetation eliminated within 3 m of road (Walker et al. 1987a) -changes in species composition within 20 m of road (Walker et al. 1987a) -alteration of soil characteristics and snowmelt patterns within 100 m of road (Walker et al. 1987a) -within one intensively studied area of the Prudhoe Bay field, 134 acres of gravel roads generated approximately 11 acres of dust-affected tundra vegetation (8% increase in roadway insects: Walker et al. 1984b, 1987b)	-summer road watering has limited effect, since winter dust fall is 10 times that of summer dust fall
snow accumulation	-not predicted	-not quantified -reduced growth and productivity of vegetation covered by late-lying snowbeds adjacent to elevated structures, and other effects similar to those created by impoundments (above)	-none
oil spills	-spill probabilities not predicted -no spills predicted specifically for oilfield (TAPS only)	-totals not quantified for oilfields -numerous small spills have occurred, presumably causing loss of vegetation and/or thermal erosion (ADEC unpbl.) -during a 71-month period (1985-87), 23 spills of various hydrocarbons covered between 5 and 10 acres of tundra vegetation (USFWS unpbl.)	-see FRESHWATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS)
winter tundra travel/ operations	-not predicted	-construction of winter trails and ice roads or pads common for occasional seismic work or temporary access/facilities (e.g., work pads, dalimation wells) -impacts largely visual, but may range from crushing of live plants, compression of live/organic layer and increased thermal subsidence, and alteration of plant community composition, to localized massive thermal erosion, inundation, and loss of vegetative cover (Walker et al. 1987a)	-State restrictions on tundra travel/operations and guidelines for ice road/pad construction generally effective in minimizing significant vegetation impacts -occasional unauthorized tundra travel within oilfields unmitigated -temporary to long-term visual effects evident in most cases
discharge of hazardous or domestic wastes	-not predicted	-approximately 8 acres of wet tundra vegetation killed by spills or discharges of hazardous (particularly solvents) or domestic wastes from service facilities in Deadhorse area (USFWS unpbl.) -resistance time and recovery of vegetation cannot be predicted	-none

BIRDS (TRANS-ALASKA PIPELINE SYSTEM)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
direct habitat loss	-39,213 acres of habitat destroyed or modified for entire TAPS route (acres for North Slope not stated in EIS; estimated at 11,600 acres) -displaced birds assumed lost from population, but not quantified -greater losses predicted where habitat limited -additional habitat loss from roads, mining, logging, and ancillary features (gravel mine, Road and electric access to previously undeveloped areas	-35,900 acres of habitat destroyed or disturbed for entire TAPS route (Pamplin 1979) -10,900 acres, or 31% of total disturbance, in narrow 18% of TAPS corridor (Pamplin 1979) -loss of 3,263 acres vegetated habitat (Pamplin 1979) resulting in loss or displacement of approximately 2,500 breeding bird pairs, based on McCaffery et al. (1982) census data -1,243 acres riparian willow lost (high bird habitat value; Carnes & Reynolds 1984) -no loss of peregrine falcon breeding habitat (USFWS unpubl.) and minimal loss of prey habitat -possible loss of some prey habitat for other cliff-nesting raptors, but not significant (R.E. Ambrose, USFWS, pers. comm.) -amount of habitat lost for tree-nesting raptors not determined -total loss or displacement of 7,200 birds due to direct and secondary habitat loss (USFWS estimate based on McCaffery et al. 1982)	-revegetation of disturbed areas in material sites and above buried pipeline, but effectiveness not assessed -for peregrine falcons-Section 7 Consultation (Endangered Species Act) and recommended protective measures (described in Recovery Plan; USFWS 1982) very effective: *within 1 mile of nest sites prohibit habitat alterations or construction of permanent facilities *within 15 miles, prohibit alteration of limited, high quality habitat which could significantly reduce prey availability -other cliff-nesting raptors benefited from protection afforded peregrine falcons -relocation of Pump Station 2 camp from peregrine falcon nests at Sagwon Bluffs
changes in species composition or density from changes in habitat quality	-not predicted	-steady increase in nesting bird density from 1976 to 1981 at Mile 12 on the Haul Road suggests bird populations re-establishing territories in areas disturbed by development (McCaffery et al. 1982) -no change in density of raptor populations attributed to habitat change; only peregrine falcons, gyrfalcons, and rough-legged hawks surveyed (Ambrose et al. 1987) -peregrine falcon populations increased due to restrictions on DDT in 1972 (Ambrose et al. 1987)	
impoundments, dust shadow, and "snow fence" effects	-changes in drainage patterns predicted but changes in bird habitat values not predicted	-nesting densities reduced in Haul Road dust shadow area (McCaffery et al. 1982) -snow and water accumulations made habitat unavailable to nesting birds along pipeline, but later provided feeding area for brood-rearing (Bahnbergor et al. 1980) -geese stage in Haul Road dust shadows very early in season, using some previously unavailable habitat (Murphy et al. 1977) -see BIRDS (FREMONT RAT OILFIELDS) for additional documentation of similar effects	-culverts reduced some impounding -no mitigation of dust shadow effects
disturbance	-all birds driven from construction sites, at least temporarily -tolerances to disturbance not quantified -geese, swans, loons, cranes, raptors less tolerant of disturbance than passerines, shorebirds, some ducks -disturbance of females on nests could cause abandonment or predation	-not assessed for most bird species -high nest predation by foxes along Haul Road (Reynes & Eberhardt 1981, Brink 1978) -nesting success of peregrine falcons and other cliff-nesting raptors not reduced by construction activities (R.E. Ambrose, USFWS, pers. comm.) -recreational activities of workers may have reduced peregrine falcon nesting success to small degree (R.E. Ambrose, USFWS, pers. comm.)	-pipeline across roads gated to restrict access and decrease disturbance -prohibition of wildlife feeding as requirement for proper garbage containment, not effective, for populations increased along roads and near facilities (Hilka 1977) -for peregrine falcons, Section 7 Consultation and recommended protective measures (described in Recovery Plan; USFWS 1982) effective, but some loss of compliance with timing restrictions (JPMAT unpbl.); *within 1 mile of nest sites require aircraft to maintain minimum altitudes of 1500' above nest level from April 15-August 31; prohibit all ground level activity from April 15-August 31 except on existing thoroughfares *within 1 miles of nest sites prohibit permanent facilities having sustained human activity and prohibit activities having high noise levels from April 15-August 31 -other cliff-nesting raptors benefited from protection afforded peregrine falcons

BIRDS (TRANS-ALASKA PIPELINE SYSTEM)(Continued) 32

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
hunting	-potential impacts on peregrine falcon by shooting adults and robbing young for falconry -hunting pressure on waterfowl and raptors could be locally severe -hunting pressure on ptarmigan would be self-regulating through density dependence	-raptors susceptible to disturbance during breeding season but hunting activity concentrated in August and September when most young already fledged -take for falconry not documented in TAPS area north of Brooks Range -public awareness/hunter education reducing incidental shooting of raptors nationwide and probably in Alaska -bird hunting levels not studied, but effects probably minor due to hunting restrictions in pipeline corridor	-Migratory Bird Treaty Act restrictions on shooting raptors -large game hunting prohibition in 5-mile zone on each side of pipeline likely discourages significant levels of bird hunting
oil spills	-detrimental to birds and habitat, but not quantified -spills in upper Sagavanirktok River drainage could damage habitat and kill waterbirds in internationally important waterfowl area	-Arigus River Spill of 1,500 barrels of crude oil affected 13-25 miles of riverine and riparian habitat (APC unpbl., USFWS unpbl.) -oiled birds found: 13 new gulls, 2 semipalmated plover nests and incubating adult, solitary sandpiper and other bird nests (white-crowned and tree sparrows) in oiled willows (USFWS unpbl.) -effects of contamination on reproductive success not studied, but probably localized and short term effects due to clean up efforts -loss of nesting habitat in riparian willows probably of longer duration (USFWS unpbl.) -effects of other spills not assessed	-see FRESHWATER QUALITY AND QUANTITY (TAPS)

BIRDS (PRUDHOE BAY OILFIELDS)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
direct habitat loss by gravel fill and extraction	-4,745 acres in oilfield would be destroyed or modified	-11,033 acres total habitat lost from existing or currently proposed gravel fill and extraction in Prudhoe Bay and surrounding oilfields (Table 2): *Prudhoe Bay and Lisburne existing: 6,705 acres *Kuparuk and Milne Point existing: 3,318 acres proposed: 443 acres *Endicott existing: 343 acres	-consolidation of facilities -use of winter ice pads for pipeline construction, not done for many major projects (Prudhoe Bay, Lisburne) but done for Endicott and proposed for Kuparuk expansion
change in habitat associated with secondary effects of gravel fill	-not predicted	-as of 1983, within 3 study blocks of Prudhoe Bay oilfield, 10% habitat loss to gravel fill, 23% habitat modified by impoundments, dust, gravel spray, debris, trucks, thermokarst, and other disturbances (Walker et al. 1984b)	-road routing and pad placement to avoid highest value wetland types (Classes III, IV, VI, Bergman et al. 1977) to minimize waterfowl habitat loss and avoid impoundment problems -minimal mitigation for shorebird nesting habitat loss
population decrease due to habitat loss	-displaced birds assumed lost from population, but not quantified -greater losses expected where habitat limited	-as of 1978 loss of 2,500 acres of habitat equated with loss of 1,000-2,000 pairs of nesting shorebirds (Connors et al. 1984) -as of 1983 direct loss of 3,440 acres of habitat in Prudhoe Bay oilfield which would support 5,200 shorebirds (about 3% of local population) (Meehan 1984) -as of 1987 loss or displacement of 13,300 birds due to direct and secondary habitat loss (USFWS estimate based on Troy 1987)	-see above
changes in species composition or density from changes in habitat quality	-not predicted	-in 1984-85 lower bird densities for 6 shorebird species found in Prudhoe Bay oilfield compared to control site, 13% reduction in numbers, 11% reduction in nests (Meehan 1986) -loss not quantified for other species -greater white-fronted geese and king eider nesting densities lower in oilfield than in control area (Troy 1987) -oldsquaw and Pacific loon found breeding only in control area (Troy 1987)	-none

STAGE (PRUDHOE BAY OILFIELDS)(Continued)

IMPACT CATEGORY	PREDICTED BY TAPE EIS	ACTUAL IMPACTS	MITIGATION
road dust shadow effects	-dust covering vegetation predicted, but loss of bird habitat value not predicted	-significantly lower densities of nesting shorebirds and passerines (especially semipalmated sandpiper, red phalarope, dunlin, Lapland longspur) documented in areas affected by dust shadows adjacent to heavily travelled roads, censused to adjacent areas (Connors et al. 1984, Troy 1986, 1987) -estimated road effects triple number of birds lost due to direct habitat loss (Connors et al. 1984)	-road watering for dust control only in summer -despite heavy watering on Endicott road, heavy dust up to 130' away (Burgess & Ritchie 1987)
early snowmelt resulting from dust shadows	-not predicted	-bird density on heavily dusted side of lightly travelled roads is higher than on less dusted side, indicating roads act as snow fences and dust effects offset by facilitating snow melt (Troy 1987) -early snowmelt areas induced by dust shadows along roads attract and concentrate migratory birds (especially waterfowl and red-necked phalaropes) in the oilfield early in the nesting season (Troy 1987, Murphy et al. 1987) -benefit (early feeding habitat) or detriment (increased disturbance and exposure to contaminants) not documented	-none
late snowbank melt along roads	-not predicted	-densities of early nesting species (semipalmated sandpiper, dunlin, Lapland longspur) reduced in road-side areas affected by persistent snowbanks and impoundments (Troy 1986, 1987)	-none
impoundments along roads	-alteration of drainage patterns predicted, but resulting loss of bird habitat not predicted	-5,453 acres of construction-related impoundments in Prudhoe Bay oilfield as of 1983, across not quantified for other adjacent oilfields (Walker et al. 1986b) -reduced shorebird breeding densities but increased densities of late summer migrants (Connors et al. 1984) -eliminated habitat or reduced suitability for 6 of 13 species during the breeding season (greater white-fronted geese, king eider, semipalmated sandpiper, dunlin, buff-breasted sandpiper, and Lapland longspur) (Troy 1986) -provided "preferred" feeding habitat for northern pintail, red-necked phalarope, and red phalarope during brooding season, but not "preferred" nesting habitat for any species (Troy 1986)	-culverts to maintain drainage patterns variably effective -culverts not possible for large pools
road effects on bird densities from combined sources of impact (disturbance, impoundments, dust)	-not predicted	-overall breeding season bird use and nesting population density lower within 320' of roads than away from roads (Troy 1986, 1987) -higher than expected use within 320' of road by long-billed dowitchers, red-necked phalaropes, and snow buntings (Troy 1986) -semipalmated sandpipers and red phalaropes significantly lower nesting densities adjacent to roads than away from roads (Troy 1987) -lower nesting densities along roads shown for Lapland longspurs, dunlins, semi sandpipers, and greater white-fronted geese (Troy 1987) -lesser golden-plovers avoided roadside areas for nesting (Troy 1987) -red-necked phalaropes only species with higher nesting densities adjacent to roads (Troy 1987)	-snow pipeline beds and roads gates to minimize traffic induces dust and disturbance
road effects on bird reproductive success	-not predicted	-poor reproductive success for Canada geese in 1986 within 300' of roads (Murphy et al. 1987) -unsuccessful greater white-fronted geese nests located more than 130' from roads with moderate traffic (Murphy et al. 1987)	
population increases for some species from habitat changes or artificial feeding	-not predicted	-pipelines and debris along roadsides provided nest sites for snow buntings (Troy 1986) -glaucous gulls in high concentrations at North Slope Borough landfill in Prudhoe Bay (Murphy et al. 1987) -feeding by nest crows (Knudsen & Eberhardt 1981)	-environmental education program for work crews to discourage feeding of wildlife largely ineffective (OSPVS suppl.)

IMPACT CATEGORY	PREDICTED BY EAPS EIS	ACTUAL IMPACTS	MITIGATION
modification of estuarine and shoreline habitats by gravel removal	-estuaries which attract waterfowl may be modified by gravel removal from islands, roads, and spits	-no documented effects due to minor amounts of gravel removal prior to State regulation	-State regulations prohibit gravel removal from islands, roads, and spits due to concern for modification of lagoon and estuarine habitats and loss of island nesting habitat for eiders, gulls, terns, and geese
modification of marine and shoreline habitats by construction of gravel causeways and artificial islands	-not predicted	-artificial gravel pier (West Dock) used less than adjacent mainland shorelines by passerines and several shorebird species, but densities of roe-necked phalaropes extremely high (Connors et al. 1984) -molting oldsquaw densities in Stump Island Lagoon reduced in 1981 and 1982 by West Dock causeway extension; no adverse effects suggested by 1983 data (Environsphere 1987) -changes in water quality could affect bird prey species availability and could modify saltmarsh habitat used by brood-rearing and staging geese, but effects not documented	
oil spills	-detrimental to birds and habitat, but threat not quantified -migratory birds restricted to coastal habitats especially vulnerable to oil -tens of thousands of molting oldsquaw and lesser numbers of common eiders, glaucous gulls and arctic terns potentially affected -ducks concentrated on rivers during migration particularly vulnerable to oil on water	-no assessment of spill effects on birds -few reports of oiled birds	-see FRESHWATER QUALITY AND QUANTITY (PRUDHOE BAY OILFIELDS
contaminants onshore	-oil ponds or pools may attract and cause mortality of ducks, shorebirds, songbirds, and raptors, especially early migrants -other contaminant effects not predicted	-birds use reserve pits particularly during spring staging (open water earlier than tundra ponds) when pits collect hydrocarbons from winter spills (Brad Prieto, ADEC, pers. comm.; USFWS suppl.) -no study of extent of bird use of reserve pits or effects of contaminants on reproductive productivity -reserve pit fluids have adverse effects on tundra pond water quality and macro-invertebrate communities (West & Snyder-Conn 1987) which may affect bird food supply, but not studied	-ADEC regulations reduced quantity of produced fluids, and required better containment in pits -no studies of effectiveness in mitigating impacts to birds
contaminants offshore	-not predicted	-USFWS data show persistent heavy metal and hydrocarbon contamination from offshore drilling effluent disposal in benthic sediments of shallow-water, low-energy environments; local effects on birds more likely than on other marine organisms since benthic infauna is food source for marine birds, but not studied	-NPDES permits limit disposal within 2-m isobath, effective only in moderate and high-energy environments
hunting (recreational and subsistence)	-low pressures on relatively unhunted breeding populations	-not studied, expected to be minor in oilfields -subsistence hunting pressure likely increased in Colville Delta from establishment of village of Nuiqsut in 1970 due to Prudhoe Bay development	-company policies prohibit firearms in oilfield -State game regulations prohibit big game hunting in most of oil field -prohibitions apparently effective in limiting bird hunting opportunities

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
Increased predation from higher predator populations	-not predicted	-observed high predation to brant and Canada geese nests by fox and glaucous gulls (unnaturally high predator populations in oilfield): *arctic fox depredated 3% of active goose nests in 1985 and 14% in 1986 *glaucous gulls depredated 33% of active goose nests in 1985 and 2% in 1986 (Murphy et al. 1986, 1987) -shorebird nesting success higher in 1972 in Prudhoe Bay after fox populations deliberately reduced by trapping (Norton et al. 1975)	-occasional trapping of foxes -garbage management ineffective
Barriers to bird movements	-not predicted	-of 17,000 birds estimated flying over 7.8 mile section of new powerline, 15-130 (.09-.8%) estimated collisions (Murphy et al. 1987) -severe behavioral responses to pedestrian and vehicle traffic during road-crossing attempts by brood-rearing snow geese along Endicott road (Burgess & Ritchie 1987) -33 snow geese collided with West Dock Seawater Treatment Plant (ARCO, pers. comm.)	-some powerlines buried or hung from pipelines
Road and construction disturbance effects on nesting waterfowl	-all birds driven from construction sites, at least temporarily -tolerance to disturbance not quantified -geese, swans, loons, cranes, raptors less tolerant of disturbance than passerines, shorebirds, some ducks -disturbance of females on nests could lead to abandonment or predation	-oilfield activity and disturbance possibly altering tundra swan distribution and decreasing reproductive effort (Murphy et al. 1986, 1987) -oilfield disturbance one factor influencing low Canada goose and brant breeding productivity in Kuparuk Development Area (Murphy et al. 1986, 1987) -Canada geese and greater white-fronted geese altered behavior patterns near roads during nesting season (Murphy et al. 1986, 1987) -cumulative effects of physiological stress from disturbance impacts may affect survival and reproduction rates but not assessed -disturbance effects on only U.S. snow goose nesting colony predicted in EIS for Endicott development project; monitoring studies thus far indicate noise and vehicle traffic along Endicott road (1 mile from colony) influenced snow goose nesting behavior patterns of nest attendance, and nesting distribution; snow goose nesting success rates lower and gosling mortality rates appear higher subsequent to Endicott construction, but no impact on numbers of geese in colony shown (Burgess & Ritchie 1986, 1987)	-road closures during summer to reduce disturbance from vehicular and human traffic partially effective (Waterflood, Kuparuk pipeline road, Lisburne pipeline pads) -winter construction of roads and pads to avoid construction impacts; not for most recent major projects (Lisburne, Endicott) but proposed for Kuparuk expansion
Road and construction disturbance effects on brood-rearing geese	-see above	-brood-rearing snow geese rarely fed undisturbed within 300' of Endicott road during heavy construction traffic in 1985 and avoided road in 1986 (Burgess & Ritchie 1986, 1987) -mild but statistically detectable effect on brood-rearing snow geese activities up to 2.3 miles from Endicott road (Burgess & Ritchie 1987)	-see above
Aircraft disturbance effects on goose behavior	-see above	-fixed-wing aircraft overflights caused reactions by 33% of male and 19% of nesting snow geese (Burgess & Ritchie 1987) -less than 30% of greater white-fronted geese and Canada geese reacted to fixed-wing and jet aircraft, but 40% reacted to helicopters (Murphy et al. 1987) -brood-rearing snow geese reacted to 323-72% of aircraft disturbance events (Murphy et al. 1987)	-flight corridors and flight ceilings established for Endicott development to avoid disturbance to nesting and brood-rearing areas generally effective, but some compliance problems with non-oilfield aircraft, and weather condition often necessitate lower flight ceilings for safety reasons (Burgess & Ritchie 1987, Garner & Reynolds 1986)
Human pedestrian disturbance effects	-see above	-more than 50% of Canada geese reacted to pedestrian disturbance events, including trash close-up crews (Murphy et al. 1987)	

CARIBOU (TRANS-ALASKA PIPELINE SYSTEM AND PRUDHOE BAY OILFIELDS)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
direct disturbance	-disturbance/harassment by human activity, noise, vehicles, aircraft etc. during TAPS construction and operation with adverse physiological effects on individuals and likely avoidance of disturbance areas	-disturbance of traditional and present use during pipeline construction and oilfield development, and continues with operational activities (Cameron et al. 1979, Whitten 1980) physiological stresses not studied -disturbed areas avoided (Cameron et al. 1979, Whitten 1980)	-restrictions on low-level aircraft operations and wildlife harassment implemented and monitored during TAPS construction -compliance not 100%, but overall harassment impacts reduced -noise, ground vehicles, and human presence disturbance not completely avoided
obstruction of movements	-all pipeline on gravel berms for major portions of TAPS could result in: *delay or failure to reach traditional habitats *reduce efficiency of range utilization *isolate from essential ranges, ultimately reduce populations *combined TAPS/Prudhoe Bay oilfield infrastructure could substantially influence summer range utilization along arctic coast -above ground pipeline on berms in vicinity of upper Sagavanirktok and Atigun Rivers could obstruct large spring migrations -road traffic an additive influence to pipeline on movement -above ground elevated pipeline with frequent provision of most available design animal crossing facilities, partial barrier to movements still predicted	-most above-ground sections ultimately supported by vertical support members which allow caribou passage (see mitigation) -TAPS route generally parallels caribou migrational routes, not perpendicular barrier to migration routes (routes not well known when predictions made) -spring and early summer movements across TAPS essentially low (Whitten & Cameron 1983) -normal east-west movements during summer in Prudhoe Bay coastal area commercially blocked by intensive industrial structures and activities (Whitten & Cameron 1983) -no large spring migration since TAPS construction -causes of no post-construction large spring migrations unknown -large migrations of Western Arctic Herd occurred prior to construction -actual impacts on large spring migrations unknown -caribou less successful in crossing elevated pipeline when paralleled by road with traffic (Curatolo & Murphy 1983) -Central Arctic Herd spring and early summer movements across TAPS partially restricted to sites of extensive elevated pipelines (Whitten & Cameron 1983)	-design modification from original on-the-ground pipeline design to elevated pipeline reduced impact -stipulations implemented for minimum pipe elevation in most above ground sections to known movement corridors -caribou movements partially facilitated by adequately elevated pipe -effectiveness of elevated pipe greatly reduced where road traffic adjacent to pipeline (Curatolo & Murphy 1983) -moderate consolidation of facilities without significant benefit to caribou -incorporation of roads and pipelines partially incorporated in recent oilfield development design -road/pipeline separation effectiveness variable based on: *intensity of industrial infrastructure *environmental factors *specific movement patterns (Curatolo & Murphy 1983) -extensive elevated pipeline accomodates fall and winter moves -mitigation only partially effective for spring and early summer movements (Whitten & Cameron 1983)
displacement from preferred habitats	-disturbance from TAPS and Prudhoe Bay construction and operation could cause avoidance of activity areas -increased mortality of displaced animals or displacement of other animals in adjourning habitats	-females with young calves avoid industrial activity areas (Cameron et al. 1979, E.V. Whitten, pers. comm.) during calving and post-calving seasons (late May-August) -effects of displaced calving on survival and population dynamics not adequately studied -removal of wolves and brown bears may partially compensate for calving displacement impacts (Miller 1977)	-timing restriction of construction activities and traffic restrictions partially effective (E.V. Whitten, ADF&G, pers. comm.)
direct mortality	-small amount of mortality from entrapment in end ditches, pipe trenches and snowdrifts if left unattended and caribou not disturbed by other human activity -increased mortality from collisions with road vehicles if caribou periodically attracted to roads by differential snow and vegetation conditions -general increase and concentration of hunting pressure if TAPS corridor north of Livengood opened to public use	-little mortality from entrapment -distur[illegible]ance have caribou from encountering these risks -Low [illegible] -use of mortality from vehicular collisions -val[illegible] -between vehicular collisions and of [illegible] ,here not studied -in ap[illegible] .nnouncement of Transportation restrictions on public [illegible]ccess, hunting closures, and prohibition of off-road vehicles, estimated harvest increased from less than 300 in 1983 to over [illegible],000 in 1983 (E.V. Whitten, ADF&G, pers. comm.)	-Field monitors controlled TAPS during construction, identified potential environmental hazards and made recommendations to appropriate authorities -implementation of article ADF&G?? and Alaska Game Code provisions on hunting from Haul Road resulted to substantially reduced harvest in 1984 (E.V. Whitten, ADF&G, pers. comm.)

CARIBOU (TRANS-ALASKA PIPELINE SYSTEM AND PROBABLE GAS UTILITIES)(Continued)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
reduced growth and survival of lichens (important local winter forage) from atmospheric pollutants released by TAPS pump stations	-local atmospheric conditions at TAPS pump stations could reduce or completely eliminate lichens in some cases -extensive winter ranges make local effects negligible -if intermediate levels of atmospheric pollutants from pump stations were widely dispersed, lichen growth could be reduced over large area and thus reduce carrying capacity	-effects of atmospheric pollution on lichens not studied; likely negligible due to use of low-sulfur fuels and production of low-sulfur crude	-none

OTHER LARGE MAMMALS (TAPS-ALASKA PIPELINE SYSTEM AND PRUDHOE BAY OILFIELDS)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
disturbance	-disturbance from construction activities would displace animals -lower levels of disturbance would continue through operation -wide ranging species (grizzly bear and wolf) least affected -sheep most affected -mammals may be deterred from pipeline area due to insulation cover, sound of flowing oil, and differential snow accumulation from drifting around pipeline	-avoidance of construction noise not quantified -sound of oil in pipeline not a problem due to insulation around pipe (TAPS unpbl.) -odor not a problem	-construction in Atigun Canyon scheduled during mid and late summer when sheep are mostly dispersed to the south -some gravel mining sites within Dall sheep lambing areas disapproved (Berger & Svanoe 1977)
direct mortality	-displaced animals could result in reduced populations -direct mortality to moose from traffic collisions -pipeline construction ditch may entrap hoofed animals and bears -grizzly bear, polar bear and Dall sheep most directly influenced from increased hunting pressure - improved access -habitat loss would displace animals and result in reduced populations	-large numbers of problem bears killed (defense of life and property) during construction (Hilke 1977) -many of problem bears continue to be killed (defense of life and property) after construction by maintenance crews -mortality related to animal feeding; animals attracted to right-of-way for handouts struck by vehicles (Hilke 1977) -moose mortalities from traffic collisions common occurrence, but unquantified -no entrapment in open ditch reported (TAPS unpbl.) -several reports of furbearers shot by trappers (Hilke 1977) -improved access following construction resulted in greater hunting and trapping pressure and increased numbers of game animals near the Pipeline (ADF&G unpbl.). Illegal hunting recognized as serious problem by State, but implications on large mammal populations not quantified -for Sagavanirktok River valley, 335 acres out of 1,675 acres (21%) of riparian moose habitat was disturbed by TAPS construction; 38% of this habitat (208 acres) could not be rehabilitated (Dennerm et al. 1987)	-corridor of five miles on both sides of pipeline centerline closed to hunting with firearms, north of Yukon River -hunting and firearms prohibited during construction -firearms prohibited in oilfields
loss of habitat	-herbivores may be attracted to vegetation over heated pipe and to snow free condition due to heated buried pipe	-impacts of habitat loss on large mammals not quantified -no preferrential feeding reported (USFWS unpbl.)	
obstruction of movements	-effect of above-ground portion of pipeline on large mammal movement cannot be conclusively predicted -knowledge of behavior reaction is limited and not a sound basis for design and spacing of animal crossing facilities -above ground pipeline with frequent provisions for animal crossing facilities of best possible design would act as partial barrier to hoofed animals	-crossing difficulties for grizzly bear and moose not reported (USFWS unpbl.) -see CARIBOU (TAPS AND PRUDHOE BAY OILFIELDS)	-stimulation requiring facilities to allow passage of large animals
feeding by humans	-carnivores, particularly bears and to a lesser extent, wolves often create nuisances or destroy property -improper disposal of trash could result in carnivores depending upon an artificial food source and losing fear of man -feeding would not occur with construction but would with public use	-extensive feeding by construction workers and camp personnel (Hilke 1977, Follmer et al. 1980) -improper garbage disposal and faulty incineration common, garbage as food source readily available (Hilke 1977) -buildings and vehicles damaged by bears searchin for food (Hilke 1977) -notable concentrations of bears and wolves near camps feeding on garbage and hexanuts (Hilke 1977)	-pipeline company anti-feeding policy ineffective due to lack of enforcement -feeding problem termed "out of control" required passage of State legislation prohibiting feeding and setting a fine of $1000 (State Law SAAL 01.210, Feeding of Game) -relocation of problem animals ineffective
disease transmitted	-not predicted	-several workers bit by problem animals required rabies vaccinations and animal usually destroyed (Follmer et al. 1980)	

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
direct impacts from construction	-direct impact of construction on smallest mammals (microtines) of limited magnitude and short duration; total 39,315 acres lost, only individual animals with home ranges within or overlapping actual construction zone would be destroyed or displaced	-actual small mammal habitat destroyed or disturbed 33,000 acres for entire TAPS route as of July, 1978 (Pamplin 1979) -approximately 5,262 acres of vegetated habitat (small mammal habitat) lost or significantly disturbed for North Slope (Pamplin 1979) -direct destruction or displacement of small mammals not quantified	-none
habitat alteration within construction zone	-vegetative cover removed unsuitable for one species replaced relatively quickly by cover favorable to similar or related species, thus minimal net loss to food chain	-impacts on microtine densities and distributions localized and related to impacts on vegetation communities (Brian 1978) -habitat loss greatest impact on microtine rodents, but significance to local population densities unknown -net impacts not quantified	-stabilization and restoration required on all disturbed areas resulted in largely unsuccessful restoration
indirect habitat impacts from construction	-little measurable indirect impact on total system, therefore small impact on small mammals (microtines) -little adverse direct or indirect impact on larger rodents and small predators	-positive correlation between small mammal population and distance from nearest pipeline structure, probably related to habitat preference (Brian 1978) -habitat alterations affecting microtines caused by gravelled areas, water impoundments, dust fallout and coating, revegetation, off-road vehicles disturbance, and oil contamination (Brian 1978) -small mammals absent from study area inundated by water impoundments due to inadequate drainage structures (Brian 1978)	-culverts reduced some impounding -mitigation of dust shadow effects minimal
increased soil temperature above buried pipeline/ microclimate adjacent to elevated section of TAPS	-potential for direct and indirect impacts -heat from buried TAPS would favor vegetation growth -would benefit smaller rodents best adapted to favored vegetation -would benefit predators	-impacts not documented	-none
increased trapping pressures on furbearers	-additional trapping harvest acceptable with proper harvest	-increased harvest due to improved access but impact level not documented	-TAPS/Haul Road corridor closed to trapping during construction, probably effective -no subsequent mitigation
oil spills	-direct adverse short-term impact, level of impact contingent on place, habitat and seasons, ranging from minute to severe -possible mortality to scavengers from ingesting petroleum from oil-killed animals	-no known impacts	-design standards, valves, surveillance and monitoring required to minimize risk of spill -approved oil spill contingency plans required, oil spill reporting requirements -immediate cleanup required of all spills
increased predation	-not predicted	-predation on microtines increased along TAPS and Haul Road corridor due to artificially high densities of Arctic foxes attracted to artificial food sources (i.e. garbage and direct feeding) along pipeline and road (Brian 1978) and direct feeding)	-incineration of solid wastes -animal feeding prohibited -mitigation only partially effective due to poor waste management and inadequate enforcement
riparian habitat alteration from material sites	-not predicted	-enhanced ground squirrel habitat and increased ground squirrel populations within disturbed areas, after completion of mining (Woodward-Clyde 1980) -vegetation removal in Arctic floodplains eliminated or drastically reduced local populations of small microtine mammals other than ground squirrels (Woodward-Clyde 1980) -rate of recolonization of mined sites directly related to redevelopment of vegetated habitats (Woodward-Clyde 1980) -microtines did not begin to reuse disturbed areas as primary habitat until development of a multi-layer of vegetation cover with densities of at least 60-70% (Woodward-Clyde 1980)	-stabilization and restoration required on all disturbed areas but largely unsuccessful

TERRESTRIAL MAMMALS (PRUDHOE BAY OILFIELDS)

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
gravel fill during construction	-total loss of 8,763 acres of habitat from gravel fill -population loss will be small percentage of total population	-total loss of 11,833 acres of vole, shrew, lemming, pika and squirrel habitat from gravel fill in oilfields (Table 1) -population level impacts unquantified -some Arctic fox den sites covered by gravel fill	-minimize impacts through siting considerations -some siting away from fox dens
habitat loss due to pad and road maintenance	-not predicted	-vegetation loss from snow removal, spreading gravel, debris, and contaminants off edge of pads and roads (Walker et al 1987a) -loss and change of vegetation from road traffic dust (Brown & Berg 1980) presumed to impact small mammal populations, not quantified	-snow removal plans provide selected snow removal locations -[illegible] effective, debri still put on tundra, but more localized -road watering, only partially effective, sources limited in some areas, contaminated water often used for road watering
hydrocarbon or other contaminant spill on tundra	-ingestion of contaminants -high localized mortality, but unquantified -larger predatory mammals prey on contaminated smaller mammals (i.e. fox eating voles)	-many oilfield pit leaks during 1986-87 period, ADEC documented 19 pits leaking (ADEC unpbl.) -impact on mammals not studied	-impermeable containment berms pit clean up schedules -mitigation only partially effective (USFWS unpbl.) -see FRESHWATER QUALITY/ QUANTITY (PRUDHOE BAY OILFIELDS)
increased predation due to increased fox populations	-not predicted	-Arctic fox populations not surveyed, but high bird nest predation documented (Murphy et al. 1986) -likely increases of predation on microtines but not studied	-trash and waste control -generally only partially effecti because fox gain access to food sources or purposefully fed by workers

MARINE MAMMALS (TRANS-ALASKA PIPELINE SYSTEM AND PRUDHOE OILFIELDS)

IMPACT CATEGORY	PREDICTED AT TAPS EIS	ACTUAL IMPACTS	MITIGATION
oil pollution	-a maximum of 64,000 barrels of oil could reach the marine environment via Sagavanirktok River in event of a major pipeline break -oil wells and feeder pipelines a greater threat of spill than the TAPS line -whales present only seasonally so exposure would be brief -polar bear are highly mobile and could contact an unconsolidated spill -if large quantities of oil became dispersed in the Beaufort Sea, biological productivity throughout the food chain could be affected	-no major spills into the marine environment have been documented	-contingency planning (leak detection and location, minimization of spill, and containment -see MARINE WATER QUALITY
increased hunting pressure	-not predicted	-instances of legal or illegal take of polar bear (USFWS unpbl.) -several bowhead whales taken during subsistence hunts facilitated by improved access and use of construction facilities on islands (USFWS unpbl.)	
attraction to human facilities	-not predicted	-polar bears and other scavengers attracted to facilities, some destroyed as nuisances, also some instances of improperly disposed waste materials (waste products from bowhead whale butchered at West Dock) attracted polar bear (USFWS unpbl.)	-State regulations controlling disposal of wastes generally effective
reduced denning in development area	-not predicted	-polar bears have historically denned in vicinity of Prudhoe bay; no recent records -ringed seal denning on ice near development area temporarily reduced during construction (Frost & Lowry 1986)	

IMPACT CATEGORY	PREDICTED BY TAPS EIS	ACTUAL IMPACTS	MITIGATION
Increased human access	-access to 140 mile strip of land from Brooks Range to Beaufort Sea not previously accessible by road (total acreage access not predicted)	-access to about 1,800 square miles used for hunting, recreation, fishing, skiing, tourism (BLM 1987) -significant impact from corridor becoming major commercial transportation artery from North Slope to rest of Alaska (ARCTY-PP unpbl.)	-land use planning by State, Borough, and BLM -land use restrictions not comprehensive -land use planning not addressing all impacts of TAPS operation
Increased demand for land use and ownership in area of access to pipeline corridor	-relatively limited demand due to remoteness and climate severity factors	-high demand for lands adjacent to pipeline corridor, BLM presently addressing demand thru EIS process (BLM 1987) -few areas (Yukon River crossing and Coldfoot) presently developed for pipeline service facilities; more are likely	-comprehensive land use planning -since the disposal process is ongoing, level of impact and effectiveness of planning process cannot be assessed for many years
Short term and permanent alteration of land values	-temporary and permanent alteration of about 5,500 acres: *reduced scenic value (aesthetics) *reduced recreational value (fish stock depletion, reduced game numbers)	-impact to scenic and recreational values to double the amount predicted, i.e., 10,900 acres (Pamplin 1979) affected during construction -operation and maintenance added additional significant impacts to corridor due to additional gravel extraction and Haul Road upgrade	-construction stimulations (Alaska State Stimulations for the Trans-Alaska Pipeline) -joint State/Federal overview of construction effective in reducing impacts
Altered subsistence values	-oil spill could result in major impact to aquatic species used in subsistence. EIS estimated 25,000 bbl would cover 0.6 acres of terrestrial habitat, unknown area in aquatic habitat -disturbance to rivers and floodplains could reduce fish populations important to subsistence	-Atigun River spill (30,000-100,000 gallons) only major TAPS pipeline spill -several spills at camps and other facilities estimates of impacts: -valve spill at Franklin Bluffs (1977) 1,300 bbls over 21 acres -cumulative small spills, estimate 5-10 acres (ADEC unpbl.) -see WATER QUALITY AND QUANTITY (TAPS) -significant disturbance to floodplain area from construction and material extraction -potential game population reductions, not quantified	-see oil spill measures in FRESHWATER QUALITY/ QUANTITY (TAPS)

IMPACT CATEGORY	PREDICTED BY EAPS EIS	ACTUAL IMPACTS	MITIGATION
altered land use patterns-change in aesthetics	-Alaska North Slope considered Largest intact wilderness area in United States -development would reduce space, habitat, and natural acoustic qualities -wilderness intrusion would be permanent -placement of 14 million cubic yards of gravel for construction of oilfield development infrastructure	-actual area of impact significantly greater than predicted, 800 square miles of pristine wilderness permanently altered -proliferation of development on-going -placement of 60 million cubic yards gravel (Table 2)	-standard siting, construction, and operation stipulations, including consolidation of facilities to minimize visual impact, only marginally effective
increased human access	-predicted to be both detrimental and beneficial detrimental from increased presence of man beneficial by providing greater opportunity for individuals to experience wilderness -increased hunter access and pressure would be minimal due to remoteness and logistical cost to access area	-road access to areas previously inaccessible by vehicular traffic: during winter about 110 miles of coast from Beechey Point (64 miles west of Prudhoe Bay) to Point Thomson (51 miles east of Prudhoe Bay) during summer, about 30 miles of coast accessible -benefit to public wilderness experience not realized because roads severely restricted for official business use or by North Slope residents -Prudhoe Bay now active staging area for hunting and fishing activities by fly-in recreationalists	-access restrictions reduced impact from increased recreational use, but not from local residents and industry use
increase in land use and ownership in areas adjacent to oilfield development	-limited demand beyond oil industry needs in immediate Prudhoe Bay area	-extensive development for support services (Deadhorse) and predicted 98 private leases of state property from ADNR approximate total acreage = 1,500 acres (ADNR unpbl.) airport and ADOT&PF related activities and leases = 823 acres (ADOT unpbl.)	-State agency regulation of support services activities only partially effective, worst violations of regulations by oilfield service activities (ADEC unpbl.)
winter tundra travel/operations	-see VEGETATION (PRUDHOE BAY OILFIELDS)		
altered subsistence values	-addressed indirectly in EIS, stating that development would cause: recreational competition with native subsistence activities greater restrictions on bag limits	-predicted impact of greater hunting pressure occurred -total closure to hunting of large portions of the North Slope within the oilfield, about 323 square miles not predicted	-none
cumulative effect of development of satellite oilfields as direct result of Prudhoe Bay field and EAPS	-not predicted	-several additional oilfields have or may cause impacts of similar nature and scope as Prudhoe Bay: 1. Endicott 2. Milne Point 3. Seal Island 4. Colville Delta 5. Point Thomson 6. Arctic National Wildlife Refuge	-standard, "state-of-the-art" mitigation with potentially some short comings previously experienced

V. SUMMARY

This discussion summarizes the salient points of the preceding comparison of environmental impacts for each of the resources considered.

A. Air Quality

Predictions for the pipeline and North Slope pump stations were that air quality standards would be met and that gaseous emissions would be low. Modelling of nitrogen oxides, sulfur dioxide, and carbon monoxide levels, based on manufacturer specifications and source performance tests, supported these predictions. However, no ambient air quality monitoring has occurred along the pipeline to verify the modelling results. The most serious air quality problems documented during construction and operation related to dust from wind and vehicular erosion of disturbed areas and roads, particularly the Haul Road. Dust impacts, including impaired visibility, were not predicted.

For the Prudhoe Bay oilfield, no quantitative predictions of emissions were made. Limited ambient air monitoring data from the oil industry (for the periods 1979-1980 and 1986-present) indicate that national standards for nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone, and total suspended particulates have all been met on an annual basis. However, short-term violations of ozone and total suspended particulate standards have occurred and levels of non-methane hydrocarbons have been high, indicating that temporary deterioration of certain air qualtiy characteristics does occur. The impacts from these short-term variances on habitat or wildlife have not been assessed.

The adequate air quality can be attributed to excellent dispersion conditions (high winds and no physical barriers), the low-sulfur content of the Sadlerochit oil, and agency requirements for best available control technology, inspections, and review. However, the current development of the Lisburne oilfield, with high-sulfur crude oil, as well as the continued addition of other satellite oilfields, may alter the air quality patterns thus far observed.

B. Freshwater Quality and Quantity

The EIS predicted only minor overall effects from the Pipeline System on the physical and chemical quality of water, with qualitative predictions of some impacts during construction, but no impacts on water quality during operation, except the potential for oil spills. Many of the construction and operations impacts did occur; thus, the predictions were accurate in a qualitative sense. However, the frequency and magnitude of impacts resulting from erosion and sedimentation; alteration of natural drainages, losses or impoundments of surface flow (as related to fish passage), and oil spills were frequently understated, and constituted the most significant and pervasive environmental problems caused by construction and operation of the Pipeline System.

In Prudhoe Bay, reduced freshwater quality and quantity were predicted to result from drainage of one lake, gravel extraction, local oil spills, and erosion from construction activities. In addition to drainage of the large lake, numerous other ponds and lakes have been partially filled with gravel for construction of roads and pads, causing substantial losses of aquatic habitat. Unauthorized gravel extraction from active floodplains also had major temporary and some long-term impacts, including siltation, sedimentation, diversion, and impoundment of water and fish. Impoundments due to blocked drainage (an impact not predicted) were extensive, resulting in the flooding of several thousand acres and the drying out of adjacent areas. Other aquatic impacts within the oilfield which were not predicted include: contamination of ponds and lakes adjacent to drill sites by heavy metals and/or hydrocarbons from reserve pit discharges or seeps, lake eutrophication by sewage, and spills of hazardous materials. The biological implications of these changes have not been fully assessed.

The frequency or magnitude of erosion and sedimentation impacts were not quantified in the EIS, although they were considered to be possible. Actual impacts during pipeline, Haul Road, and oilfield construction were widespread and severe, and recurring siltation problems resulted from construction in and near rivers, streams, and lakes, and from stream crossings along the pipeline and Haul Road. Two unpredicted sources of siltation were annual road washouts and erosion of stockpiled overburden at gravel excavation sites.

Pipeline oil spill frequencies were not predicted, their size was underestimated, and their anticipated source was limited to pipeline leaks. Actual impacts occurred from numerous sources, including undetected leaks in buried fuel lines at construction camps and spills from fuel truck accidents. No follow-up studies have assessed the actual water quality impacts from oil spills.

Water consumption at pipeline camps and facilities was estimated, but actual usage has not been fully documented. Predicted use did not include quantities required to construct ice roads and pads along the pipeline or in the oilfields. At the time of the predictions, the technology of ice road/pad construction had not been developed. The quantity of water required for development of the oilfields, for both domestic and industrial use, was not anticipated. Initially inadequate planning led to shortages, indiscriminate water withdrawal, and some fish kills. Upon recognition of the problem, adequate non-fish-bearing sources were identified. Industry also accidentally or purposefully created large reservoirs when breached riverside gravel pits diverted streamflow during breakup.

Recent development of stricter monitoring requirements for wastewater discharge and implementation of Corps of Engineers 404 permitting with agency review and monitoring have been critical to reducing overall impacts to natural waters, as has State compliance monitoring and regulations protecting water quality and anadromous fish streams.

Oil industry reporting and cleanup practices have been relatively effective in reducing oil spill volumes and impacts to tundra and natural water bodies, but service industry compliance has been a problem. Often the specific offending party cannot be identified or located. The recent refusal of oil companies to accept and inject third-party (service industry) hazardous substances can be expected to increase the incidence of illegal disposals to natural waters and wetlands.

C. Marine Water Quality

Since expansion of production into the marine environment was not foreseen in the EIS, the only effect on marine water quality predicted to result from development of the pipeline and the oilfields was the possibility that an oil spill into one of the major streams along the Arctic coast might reach the Beaufort Sea. However, the probability of such an event and its effects on marine systems were not quantified. Although major spills have not occurred, numerous minor spills from heavy equipment operations, support facilities, and drillsites have entered the nearshore zone. The cumulative impacts of these spills have not been assessed.

The additional effects of seawater treatment chemicals, drilling effluents, and other wastewater discharge from offshore drilling islands, and alteration of oceanographic conditions through the construction of causeways, were not predicted. Some adverse effects from these activities have been measured, but their implications for biological systems can only be assessed over the long term. National Pollutant Discharge Elimination System permit stipulations appear to have reduced discharge effects, but effective mitigation of causeway-induced oceanographic changes has not been achieved.

D. Freshwater Invertebrates

Localized toxic responses were predicted for aquatic invertebrates subjected to oil spills or oily discharges. Local losses through burial of invertebrates were also predicted as a result of erosion and sedimentation during construction and maintenance activities. Neither the magnitude nor the duration of these impacts was quantified.

Limited post-construction studies have shown long-term reductions in productivity and taxonomic diversity in some streams adjacent to the pipeline and Haul Road, although no studies were conducted during construction when impacts were most severe. Numerous oil spills contaminated both lotic and lentic freshwater bodies along the pipeline corridor, but neither the extent nor duration of biological effects from oil contamination have been assessed.

There have been few documented spills of oil directly into freshwater in the oilfields. However, contaminated snow bulldozed off the pads and lightly oiled reserve pit fluids have been sources of contamination. Loss of crustaceans from tundra ponds receiving these fluids was

statistically correlated with aromatic hydrocarbon concentrations. Decreased taxonomic diversity and abundance of nondipteran invertebrates was also found at these sites and attributed to degraded water quality and contaminant levels. Certain reserve pit fluids were shown to exert subacute and chronic toxicity even when diluted. Sedimentation and turbidity are suspected as having adverse effects, but have not been studied or quantified.

In recent years, more stringent monitoring requirements and wastewater discharge permits have resulted in an overall improvement in wastewater quality, which is likely to reduce invertebrate mortality. However, full compliance has not been achieved.

E. Marine Invertebrates

Impacts on marine invertebrates were not anticipated by the EIS, and it is too early to assess how populations and food webs have been affected by the various alterations of the marine environment which have taken place. Direct loss of habitat or organisms through burial or elimination of habitat, lethal or sub-lethal effects from discharges of drilling effluents and seawater treatment chemicals, and entrainment in seawater intakes have all had documented localized impacts on marine invertebrates. While measures such as discharge limitations and construction of bypass systems in treatment plants have mitigated some of these losses, the net effect remains unknown.

F. Freshwater Fish

Impacts to fish resources were some of the most significant environmental problems directly associated with the construction of the pipeline and oilfields, and were in many cases more serious or of longer duration than implied by the qualitative predictions in the EIS. The most serious and extensive problems involved alteration of natural drainages, erosion, sedimentation, debris and fill in rivers or streams, and blockage of fish passage. Oil spills, which were predicted to be a potential problem, been smaller but more frequent than expected. The primary sources of these problems were road crossings of stream or river channels, erosion control structures, and instream mining for fill material.

Significant fishery resource impacts not predicted for the pipeline included changes in fish density, distribution, and species composition resulting from habitat alterations. In a few cases, rehabilitated material sites enhanced fisheries habitat or created new habitat conditions. However, most habitat modifications resulted in a net decrease of habitat quantity and/or quality. Habitat modifications included changes in substrate characteristics, suspended sediment, loss of bank and instream cover, straightening of stream channels, loss of surface flow, and increased braiding (increased width and decreased depth) where gravel was spread across floodplains.

Barriers to fish movements from road and pipeline crossings and habitat alterations were predicted for Prudhoe Bay oilfield development, but the predictions were qualitative and understated. Similar impacts were not predicted for the pipeline corridor. Obstacles to fish movements eliminated otherwise available fish habitat, and affected different sizes and species of fish with differing severity.

Another impact not clearly addressed was fish mortality. Fish were entrapped and prevented from migrating to winter habitat due to loss of surface flows resulting from instream or adjacent mining impacts, or interception of surface flow by thaw zones around the buried pipeline. Mortalities also resulted when environmental perturbations, such as heavy sediment loads during winter instream construction, or dewatering, rendered additional stresses to fish already subject to natural harsh conditions.

G. Marine Fish

The possibility of oil spills entering the marine environment via coastal rivers was considered, but not quantified. Since the EIS failed to consider oilfield development in the marine environment, causeway-induced impacts on anadromous fish were not predicted. Thus far, thousands of acres of nearshore brackish water feeding habitat have been altered by two causeways. The carrying capacity of this habitat has been reduced by significant changes in oceanographic conditions (lowered temperatures and elevated salinities) and resulting changes in invertebrate prey abundance. Habitat changes and the presence of physical barriers may also limit longshore movements to feeding areas and may interfere with fall movements to traditional overwintering sites in the principal river deltas. Entrainment of larval fish in seawater intakes may also affect recruitment. Effective mitigation of most of these problems has not been implemented, since their long-term impacts have yet to be measured.

H. Vegetation

Fill and excavation accounted for most of the predicted and actual direct losses of vegetation along the pipeline corridor and in the oilfields. Numerous indirect impacts, both expected and unexpected, accounted for additional losses. Predicted indirect effects included thermokarst, erosion and subsequent redeposition of exposed soil or fill, alterations of drainage (washouts and impoundments), stream icing and its effect on riparian vegetation, and increased off-road vehicular travel by the public. Several indirect effects were not addressed in the EIS, including road dust deposition, snow accumulation due to snow removal practices and wind-drifting, and the introduction of non-native weeds to Arctic Alaska. Some contaminant effects were expected but not quantified, such as oil spills and pump station emissions, while the loss or alteration of vegetation due to discharge of human or hazardous wastes in the oilfields was not anticipated. Overall, vegetation losses in the Alaskan Arctic exceeded predictions.

The effectiveness of mitigative measures in reducing the net loss of vegetative cover in the Arctic has been minimal. Initially, revegetation using introduced grasses stabilized and reduced erosion in some areas along the pipeline corridor, but their cover on most sites has gradually declined, while reinvasion by native plants has been extremely slow in all but the most favorable sites. In some cases, indirect losses have been minimized through the incorporation of design features (siting, culverts, etc.), but there is continued loss or alteration of plant cover adjacent to facilities due to dust, thermokarst, snow accumulation, and impoundments.

I. Birds

The greatest impact to birds in the pipeline corridor and oilfields was habitat loss due to gravel fill and excavation, and associated secondary effects. The direct habitat loss for the pipeline corridor was close to that predicted, but for the oilfield nearly twice the predicted amount was lost. Significant additional unpredicted loss of bird habitat value resulted from indirect impacts to vegetation and aquatic habitats, described previously. Consolidation of facilities, siting to avoid high value wetlands, culverting to maintain drainages, and use of winter ice pads for construction reduced habitat loss, but these measures were not always used effectively, and there has been virtually no restoration of lost habitat in the oilfields. Direct and secondary habitat losses resulted in a total estimated loss or displacement of 22,500 birds, with possible additional losses due to unquantified impacts.

It was predicted that oil spills, hunting, and disturbance by construction activities would affect birds, but these predicted impacts were not quantified. Actual impacts of oil spills and hunting have not been assessed but have probably been minor. Restricted public access in the pipeline corridor and oilfield has reduced impacts from human disturbance and hunting, but construction and operation disturbance have resulted in documented behavioral and distributional changes for several waterfowl species in the oilfield. In some cases disturbance was reduced by winter construction. The Endangered Species Act was effective in preventing predicted impacts to peregrine falcons and concurrently minimized effects on other cliff-nesting raptors.

Impacts to birds which were not predicted but have been documented include: changes in bird densities (increase for glaucous gulls and snow buntings, decrease for most other species); increases in predators (glaucous gulls, arctic foxes) resulting in increased predation of birds and nests in the oilfield; collisions of migrating birds with powerlines and buildings; and barriers to movement of brood-rearing geese by roads. The attraction of some birds to early snowmelt areas and impoundments along roads was not predicted, and its effect on populations has not been quantified. The effects of marine causeways and contaminants on birds were not predicted and have not been fully assessed, although effects on bird habitats have been documented. Cumulative effects on survival and reproduction of bird populations from all of the above impacts have not been assessed.

J. Caribou

Caribou were expected to avoid areas of disturbance, and normal herd movement was predicted to be impaired by the presence of pipelines placed on gravel berms or, to a lesser extent, by elevated pipelines. Displacement was predicted to lead to increased mortality. Direct mortality was expected to result from accidents associated with construction and increased hunting pressure. Pump station emissions were predicted to cause localized reductions in lichen cover, thus reducing food availability.

As expected, disturbance was extensive during construction, and has continued at low levels during operations. Some spring and early summer movements of Central Arctic Herd animals across the pipeline corridor have been partially restricted; however, overall movement has been less impaired than predicted, primarily because normal migrational movements tend to parallel the pipeline corridor (a fact not known at the time), but also because above-ground sections of the pipeline were ultimately elevated five or more feet above the surface. In addition, the killing, removal, or displacement of bears and wolves has reduced predation on the Central Arctic Herd, which may account for the recent increase in its numbers. Predicted effects on the large spring movements through the Brooks Range of animals from the Western Arctic Herd were never tested, since the migrational patterns of this herd subsequently changed.

Little direct mortality has resulted from accidents, since the source of disturbance has tended to reduce the potential for conflicts. However, there has been some increase in hunting pressure due to inadequate enforcement of regulations. The predicted effects of pollutants from pump station emissions have not been studied, but are presumed to have been negligible. The observed avoidance of industrial activities by females with young calves was not foreseen.

Pipeline elevation has been the most effective mitigation measure in reducing predicted impacts on caribou, although movement is still affected during spring and early summer, and crossing has been found to be less likely where the pipeline is paralleled by well-traveled roads. Timing restrictions on construction activities during critical life history periods also served to lessen predicted effects. Few adverse impacts have resulted that were not predicted in the EIS.

K. Other Large Mammals

Disturbance during pipeline construction was predicted to displace large mammals, especially Dall sheep. Large mammals did avoid construction activities, but disturbance to Dall sheep was minimized by timing restrictions on construction. Direct mortality was predicted as a result of habitat loss, construction activities, and traffic collisions. Population effects due to the displacement of animals from their habitats are not known. The most significant effect to large mammals is the improved access which has resulted in greater hunting and trapping pressure, although a five-mile wide band on either side of the pipeline

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corridor is closed to hunting with firearms. A large number of bears were killed in defense of life and property during construction and many continue to be killed during pipeline operation. Moose have been and continue to be killed along the haul road in collisions with vehicles. The pipeline was predicted to be a partial obstruction to movement of hoofed animals. Crossing difficulties north of the Brooks Range have not been reported for moose or bear. The feeding of wildlife was only predicted to be a problem after the Haul Road was opened to public use, but was actually a problem during construction despite the "no feeding" policy. Feeding of wildlife combined with improper garbage disposal resulted in bears and wolves concentrating around construction camps. The State has subsequently passed legislation prohibiting the feeding of wildlife. Notable impacts to large mammals (other than caribou) in the Prudhoe Bay oilfields did not occur since these species are not common in this area.

L. Small Mammals

Impacts to small mammals were predicted to be of limited magnitude and short duration and would likely result from construction-related activities, oil spills, and operation and maintenance of facilities. Where excavation or placement of fill altered vegetation, individual animals with home ranges within or overlapping the actual construction zone would be destroyed or displaced, with limited effects on food chains. Although population level impacts were not assessed, the area of small mammal habitat lost due to gravel fill or excavation was significantly greater than predicted. In addition, impacts from facilities operation and maintenance were significantly greater than predicted.

The EIS predicted minor reductions in predator populations. Actual impacts resulted in increased predator populations, particularly fox. This likely had an indirect impact on prey populations, particularly birds and waterfowl in the oilfield area. Mitigation in the form of strict food waste disposal and control of food sources could have reduced impacts; however, little attempt was made in this regard.

M. Marine Mammals

Oil spills into river systems and/or directly into the marine environment were predicted to be major sources of impacts to marine mammals. Large spills in the Beaufort Sea could potentially have direct impacts on polar bears, seals, and whales, and indirect impacts on marine mammal food sources. No major oil spills have been reported. Numerous small spills have occurred, but impacts have not been documented.

Impacts not predicted by the EIS, but for which actual impacts have been documented, include increased hunting pressure, elimination of nuisance polar bears associated with drilling operations, reduced polar bear denning activity within oilfields, and temporary displacement of denning ringed seals.

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N. Wilderness

The region of Alaska traversed by the pipeline, and within which the Prudhoe Bay oilfield development was sited, was considered in 1970 to be the largest single expanse of intact wilderness left in the United States. The EIS predicted that improved access to these lands, increased commercial and recreational demands on lands adjacent to the pipeline corridor, and possible physical alteration from construction and operation of facilities would result in impacts to aesthetics, fish and wildlife resources, and native subsistence values. It was also predicted that impacts would be both temporary and permanent, but the level would be limited by the remoteness of location and the severity of climate. Actual impacts to wilderness have been much greater than predicted due to the unanticipated demand for land by the oil industry, related support services, and local residents. These impacts are presently occurring and will probably increase in the foreseeable future. Land use planning and application of construction stipulations that minimize facility sprawl and visual impact have only been marginally effective in minimizing impacts to wilderness values.

VI. CONCLUSIONS

Fish and wildlife habitat losses resulting from construction and operation of the Pipeline System and Prudhoe Bay oilfields were greatly underestimated in the EIS. They included the direct loss of 22,000 acres from gravel fill and excavation, the even greater indirect losses of habitat quality due to the secondary impacts of construction (dust, siltation, erosion, impoundments, contaminants, etc.), and blockage of fish and wildlife access to habitat by roads, pipelines, and causeways. Some of these indirect impacts were not predicted in the EIS, and the observed magnitude or frequency of others were greater than expected. Although some effort has been made to reduce habitat loss (through siting, consolidation of facilities, culverting, etc.), rehabilitation efforts along the Pipeline System have resulted in little restoration of habitat values, and there has been virtually no concerted effort to restore such values in the oilfields.

The qualitative nature of the EIS predictions made comparison of actual with predicted impacts difficult, and assessment of actual impacts was further confounded by the lack of baseline information and studies designed to specifically address EIS predictions. Monitoring efforts during pipeline construction focused on crisis-level reponses to the most visible and immediate impacts, and did not address the more subtle or latent effects on biological systems. Long-term and cumulative impacts have yet to be assessed, while additional impacts will continue to occur as a result of further oilfield expansion and/or the potential for opening new areas to public or private interests along the pipeline and oilfield roads. The chain of events initiated by these developments continues, and it is difficult to separate their effects from those caused by the many other developments they have set in motion.

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The fact that many impacts were either unpredicted, underestimated, or misunderstood may be partially attributable to the EIS being one of the first impact statements prepared under the National Environmental Policy Act, but a similar lack of predictive capability may be expected whenever development moves into new geographical areas or employs new engineering methods and facility designs.

This analysis clearly demonstrates that adequate baseline information and long-term monitoring studies are essential for accurate impact assessment, as well as for improving future predictive capabilities. Onsite monitoring of development activities by well-trained personnel with enforcement authority and adequate funding is also critical for both minimizing anticipated impacts and timely assessment of unexpected impacts.

Question from Senator Wirth

QUESTION: Was any staff member of the Fish and Wildlife Service asked or ordered by any superior to destroy a memo or letter, in draft or final form, concerning the biological impacts of the proposed Niakuk field causeway? If so, where did the order originate? Was the memo destroyed? If not, please provide a copy of the memo.

ANSWER: The final draft and working drafts of the Service position on the Niakuk Causeway were not ordered destroyed. They are on file at the Service's Fairbanks Ecological Services office. The final draft is also on file at the Service's Region 7 Regional Office. We are providing a copy as part of the response to the question on the impacts of causeways on fishery resources.

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NORTHERN ALASKA ECOLOGICAL SERVICES
Room 232, Federal Building, Box 20
101 Twelfth Avenue
Fairbanks, Alaska 99701-6267
September 8, 1988

Colonel William W. Kakel
District Engineer, Alaska District
U.S. Army Corps of Engineers
Post Office Box 898
Anchorage, Alaska 99506-0898

Re: 2-880446
Beaufort Sea 419

Dear Colonel Kakel:

The Fish and Wildlife Service and Minerals Management Service have reviewed the referenced public notice of application by Standard Alaska Production Company to place approximately 1 million cubic yards of gravel in navigable waters of the Beaufort Sea and approximately 100,000 cubic yards of gravel on tundra wetlands in the vicinity of Heald Point on the western side of the Sagavanirktok River Delta. The applicant proposes to 1) expand the existing Niakuk 4 artificial gravel island, 2) construct a 6600' solid-fill gravel causeway to connect this island with the mainland at Heald Point, 3) contruct a 350' breach in the causeway, and 4) construct a gravel road to connect the causeway with existing facilities at Lisburne Drill Site L-5. The purpose of the project is to recover oil and gas from the Niakuk reservoir and develop a pipeline and surface transportation corridor to onshore production facilities.

The Fish and Wildlife Service has evaluated the fish and wildlife resources of the project area, and potential environmental impacts of the proposed project, as required under the Fish and Wildlife Coordination Act. Comments on economics and technical feasibility of the proposed project, provided by Minerals Management Service, have been incorporated.

FISH AND WILDLIFE RESOURCES OF THE PROJECT AREA

The nearshore zone of the Beaufort Sea between the Sagavanirktok and Colville Rivers supports an assemblage of anadromous fish species of sport, subsistence, and commercial importance. These include Arctic and least cisco, broad whitefish, and Arctic char. The Arctic cisco utilizing this habitat are also of international importance, since they comprise a portion of spawning stocks of this species from the Mackenzie River, and are known to forage and overwinter only in this region of the western Beaufort Sea (Gallaway et al. 1983, Envirosphere 1988).

Within this region, the project site lies between overwintering areas of the Sagavanirktok River and the summer foraging habitat of Prudhoe Bay, Gwydyr Bay, and Simpson Lagoon. Prior to construction of the Endicott and West Dock causeways, these areas were joined by a narrow, relatively continuous nearshore zone having temperature and salinity characteristics intermediate between the colder, higher salinity marine water offshore and the nearly fresh plumes of the principal rivers. Arctic anadromous fish species are physiologically and ecologically adapted to this warmer, lower salinity water for summer dispersal and access to high invertebrate prey concentrations. They must accumulate sufficient food reserves during the short open-water season for growth, overwintering survival, and reproduction. Access to optimal foraging habitat as oceanographic conditions change under the influence of meteorologic factors and seasonal trends, and unhindered migration between summer foraging habitat and overwintering sites are thus important factors affecting recruitment and ultimately population size. As described below, the two existing causeways have already had a profound effect on the spatial and temporal continuity of this habitat. The proposed Niakuk causeway would be located approximately midway between the two existing causeways and would cross the nearshore zone at a location which has been identified as a heavily utilized fish migration corridor (Moulton et al. 1985).

Many species of migratory birds also use the project area. The adjacent Sagavanirktok River Delta and Prudhoe Bay shoreline provide important nesting, staging, and brood-rearing areas for several National Resource Species, including snow geese, tundra swan, brant, Canada geese, and greater white-fronted geese. The only known snow goose nesting colony in the United States is located nearby on Howe Island in the Sagavanirktok River Delta. This island and adjacent Duck Island support two of the largest known brant colonies in the area. The Niakuk Islands and other islands of the Sagavanirktok River Delta also support nesting glaucous gulls and common eiders. Oldsquaw, Pacific and red-throated loons, and king and common eiders use the nearshore waters for feeding during nesting, molt, and migration. Spring run-off from the Sagavanirktok River provides important early season open-water habitat for waterfowl and loons.

The Sagavanirktok River Delta also provides an important insect-relief area for the central Arctic caribou herd. Caribou depend on free access to the coastal fringe and promontories when summer harassment by mosquitoes and oestrid flies becomes intolerable at inland areas.

Overall, the nearshore brackish water zone from Foggy Island Bay west to Harrison Bay (generally the region under the influence of freshwater discharge from the Sagavanirktok and Colville Rivers) can be classified as having high value for summer feeding by anadromous fish, particularly ciscoes and whitefish. These species are of both local and international importance, and their aquatic habitat can be considered unique within the context of the western Beaufort Sea ecoregion (i.e., the Beaufort Sea west of the Mackenzie River). The previous construction of two causeways has led to this habitat becoming more scarce within this biogeographic setting.

Onshore, the coastal wetland habitats within and adjacent to the Sagavanirktok River Delta are of medium value for nesting and brood-rearing by the more widely distributed tundra swan, Canada and greater white-fronted geese. In contrast, considering the proximity of the scarce and unique resource of the Howe Island snow goose nesting colony, and the nearby concentrations of nesting brant, the affected area includes high value brood-rearing habitat for these species. The coastal fringe of the Delta has medium value as caribou insect-relief habitat.

DOCUMENTED IMPACTS OF EXISTING DEVELOPMENTS

The project site falls within the study areas of several environmental assessment and monitoring programs carried out in conjunction with similar coastal developments (the Endicott and Lisburne projects). In addition, the effects of the West Dock/Waterflood causeway on oceanography and fish movement were monitored for four years. Thus, the physical and potential biological effects of two existing causeways (Endicott and West Dock) on the nearshore marine environment and the importance of this area to anadromous fish have now been well documented (see Envirosphere 1987a,b; 1988 for summaries of this information). These effects include:

- Offshore deflection and increased mixing of freshwater discharged from the Sagavanirtok River during the open water season, with a concommitant reduction in nearshore brackish water habitat.

- Sharp habitat discontinuities and physiological barriers to fish migration resulting from intensified inshore upwelling of colder, more saline water in conjunction with offshore displacement of freshwater plumes.

- Net reductions in the quantity, quality, and accessibility of limited optimal foraging habitat for anadromous fish due to the influence of the above two effects.

- Both direct and indirect hindrance of anadromous fish migration due to the respective physical and oceanographic barriers created by causeways.

- Habitat alterations leading to probable reduced prey availability and thermo- or osmoregulatory stress, which have the potential to reduce growth and recruitment in some anadromous fish species' populations.

- Circumstantial evidence that regional declines of cisco and whitefish populations may have occurred since construction of the two existing causeways.

At a minimum, there has been a reduction in the carrying capacity of nearshore habitat in the region, and there is a risk of long-term declines in species' populations. These effects will remain without the added impacts of a third causeway.

Although the greatest environmental impacts of this project are likely to result from causeway-induced effects, the cumulative impact of onshore activities on the Sagavanirktok River Delta should also be considered. Disturbance to nesting and brood-rearing geese from helicopter and road traffic, from humans on foot, and from slowed or stopped vehicles has been documented within the Lisburne and Endicott onshore development areas (Burgess and Ritchie 1987a, 1987b, 1988; Murphy et al. 1986, 1987, 1988). Disturbance has resulted in both behavioral changes and avoidance of roads by brood-rearing geese. A shift in distribution of snow goose nests away from the Endicott road has been observed in the Howe Island colony since construction began in 1985. Vehicle traffic along the Endicott road has interfered with crossing attempts by brood-rearing snow geese, and has resulted in some mortality.

EXPECTED IMPACTS OF THE NIAKUK DEVELOPMENT

Based on the above evidence, we expect the proposed Niakuk causeway to have the following effects on nearshore aquatic habitat:

- Entrapment and/or further deflection of that portion of the Sagavanirktok River freshwater plume generated by the western distributaries of the Delta, particularly during the prevailing easterly winds. The result would be the near total loss of this freshwater source to potential habitat areas west of the Delta.

- Further intensification of the marine water intrusion already occurring within Prudhoe Bay since construction of the Endicott causeway. With causeways on both sides (West Dock and Niakuk), existing foraging habitat within the bay could be largely eliminated.

- Continued deterioration or loss of optimal foraging habitat, with the development of a more or less regular discontinuity in the nearshore zone which would present a season-long physiological barrier to anadromous fish movements, particularly to overwintering areas of the Sagavanirktok River.

- Creation of a third physical barrier to fish movement in the area, causing additional delays in migrations to foraging and overwintering areas.

- Potential cumulative population-level impacts to anadromous fish species, particularly Arctic and least cisco, and broad whitefish.

In addition to the above offshore effects, increased traffic along the road to Heald Point resulting from the proposed development would increase disturbance to nesting and brood-rearing swans and geese. Disturbance during nesting and brood-rearing can result in increased predation of nests and young, or nest abandonment. During brood-rearing and staging it can interfere with accumulation of fat reserves for migration through decreasing foraging time or available foraging habitat, or increasing physiological stress and energy expenditure. Any of these factors may contribute to lowered growth, reproduction, and survival of

the population. Since this will be the second major development within the Delta, its effects on these species may also be cumulative. The road and pipeline corridor would provide an additional barrier to caribou movement within the coastal insect relief area.

ECONOMIC CONSIDERATIONS

The Minerals Management Service has reviewed the extensive geophysical and geological data on oil and gas reserves made available to them by industry, the applicant's own assessment, and the State of Alaska. They concluded that building a breached causeway is the lowest cost option; the subsea pipeline option is the next lowest cost option, but lacks the year-round mobility that the causeway provides; and the cost of an elevated bridge-causeway is considered prohibitive. They did not provide an assessment of the relative costs of directional drilling, of a causeway with multiple breaching or a combination of methodologies.

TECHNICAL FEASIBILITY

The Minerals Management Service analyzed the technical feasibility of two development options other than construction of a solid-fill causeway with an elevated pipeline: extended reach drilling from an onshore site, and subsea pipeline transport. They did not consider the option of a solid-fill causeway with greater breaching than the applicant's proposal, or an elevated bridge-causeway or of a combination of methodologies.

Their analysis indicates that the technology probably exists to drill wells with the necessary departures from vertical to exploit the Niakuk field from an onshore location. However, there does not appear to be sufficient reservoir knowledge at this time to confidently pursue a shore-based directional well development program at Niakuk. Past development via wide departure drilling has been limited to fields with extensive reservoir knowlecge, as a means of reaching difficult areas of the reservoir (in-fill drilling) and in response to other reservoir enhancement needs (pressure maintenance, reduce coning, etc.), and remains relatively untested for primary development drilling (exploiting a new reservoir). The inability to predict reservoir performance with wide departure wells make such a development a risky undertaking. While there is considerable technology available for drilling high deviation wells, such wells are inherently higher risk than more conventional vertical wells, and are more expensive to drill.

For the subsea pipeline development option, Minerals Management Service believes the technology exists, but remains untested in the U.S. Beaufort Sea. Access, safety, and maintenance considerations make this option less desireable.

CONCLUSIONS AND RECOMMENDATIONS

We believe that the production resulting from the project will be a significant contribution to the Nation's domestic energy production and support development of the Niakuk field. However, after review of

relevant technical, economic, and environmental analyses of causeway developments over the past five years, we have concluded that significant potential adverse effects would occur to fish and wildlife resources.

The Corps has already determined that unacceptable adverse impacts to fish habitat have resulted from the Endicott causeway (May 5, 1988, letter to Regional Director Stieglitz from Colonel Gregory). Similar adverse effects have been documented for the West Dock causeway (Environsphere 1988). The presence of a third causeway in the proposed location will exacerbate the ongoing deterioration of nearshore aquatic habitat.

It is our opinion that the proposed work may have significant and therefore unacceptable adverse impacts on important fisheries resources. The applicant has not included adequate measures to mitigate the likely effects of a solid-fill causeway, either through the selection of alternatives or the incorporation of design considerations that will truly minimize impacts. Breaching that has been incorporated into existing causeways (700' in the Endicott Causeway and 50' in the West Dock) has proven ineffective in passing fish and ameliorating oceanographic discontinuities (Envirosphere 1987a, 1988). Therefore, we do not believe that the applicant's proposal to incorporate a 350' breach in the Niakuk causeway will effectively mitigate impacts.

Furthermore, as stated in our earlier comments on the applicant's informational document for the proposed project, we believe you should carefully consider the National Environmental Policy Act compliance issue. While we recognize it is your decision whether an Environmental Assessment or Environmental Impact Statement is required, we do not believe that a Finding of No Significant Impact can be substantiated for a 6600' causeway constructed in the Beaufort Sea.

We have emphasized causeway effects in our analysis of project impacts because we feel that onshore impacts could be partially mitigated through avoidance and minimization practices commonly used elsewhere in the oilfields. The applicant has proposed such measures as consolidation of facilities and winter construction to address some of these problems. If the work proceeds, we would also recommend controlled access and slower speed limits be implemented on the road to LD-5 and Heald Point during the nesting and brood-rearing seasons for geese. While further steps may be necessary to assure that direct conflicts with wildlife and wetland habitat losses would be fully mitigated, we are confident that this could be achieved through a mutual good-faith effort on the part of the applicant and concerned agencies.

It is our policy to seek mitigation of impacts to high value habitats through avoidance or minimization with no net in-kind habitat loss. Therefore, we cannot support a project design which does not achieve these goals. Based on the unacceptable major impacts expected to result from the proposed causeway design, we recommend that the permit for the development be denied.

We are willing to meet with you and the applicant to explore practicable alternatives to the current solid-fill causeway design for this proposal. Such an alternative would be expected to avoid further local and regional nearshore habitat degradation and allow unhindered movement of anadromous fish. If you propose not to accept this recommendation, please advise us before permit issuance in accordance with the "local procedures" agreed to by our offices.

These comments are submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661 et seq.) and constitute the report of the Department of the Interior. These comments also are for use in your determination of 404(b)(1) guidelines compliance (40 CFR 230), and in your public interest review (33 CFR 320.4) relating to protection of fish and wildlife resources. We appreciate this opportunity to comment.

Sincerely,

Paul E. Gertler
Field Supervisor

cc: Ron Morris, NMFS, Anchorage
Rich Sumner, EPA, Anchorage
Ray R. Emerson, MMS, Anchorage
John Warren, DG&G, Anchorage
Warren Matumeak, NSB, Barrow
Patti Wightman, DGC, Fairbanks
Al Utt, ADF&G, Fairbanks
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Attachment 3

Minerals Management Service memorandum dated September 7, 1988 to the U.S. Fish and Wildlife Service

MINERALS MANAGEMENT SERVICE'S SUMMARY OF THE EFFECTS ON ANADROMOUS FISH

This section summarizes some of the previously documented effects on anadromous fish of two existing Beaufort Sea causeways, West Dock and Endicott. The summary distinguishes carefully between the documented effects of the two causeways and relates the effects to the breach size and placement in each causeway. West Dock has relatively small breaches in the outer part of the causeway; Endicott has relatively large breaches in both the nearshore and outer parts of the causeway.

This section also summarizes some of the documented area-wide changes in anadromous fish populations that are related to causeways. The probable effects of the proposed Niakuk causeway are estimated on the basis of the documented causeway-specific effects and area-wide changes, and on the MMS analysis of the oceanographic effects of the Niakuk causeway (see Attachment 2 to the MMS memorandum to U.S. Fish and Wildlife Service).

WEST DOCK

The West Dock and its waterflood extension is 2.5 miles long and has 50 feet of breaching in the outer extension. The breach was designed to provide flow sufficient to support fish migration; however, according to the U.S. Army

Corps of Engineers (USACOE) permit the breach was not intended to ameliorate water quality differences on opposite side of the causeway.

A comprehensive synthesis of the results of the environmental studies on West Dock was recently completed for the USACOE; that report is entitled the Prudhoe Bay Waterflood Project Comprehensive Marine Report. The report includes the results of the physical and biological studies on West Dock and a comprehensive assessment of the effects of West Dock and its waterflood extension on the marine environment of the coastal Beaufort Sea. The summary below is based also on the 1988 Colville River Fish Study and the assessment of the cumulative effect on fishes of construction activities that is in the Final Environmental Impact Statement for the Alaska Outer Continental Shelf Beaufort Sea Sale 97. The following are the documented effects of West Dock on anadromous fish.

The Sagavanirktok River population of broad whitefish has slightly declined. This has been shown by a 4-year study of cohorts or year classes.

Fish which are on the west side of the West Dock during westerly winds are subject to exposure to cold, marine waters upon the next change in wind direction. The extent to which this occurs has implications for growth and fecundity in the fish populations that depend on Gwydyr Bay lagoon for feeding in the summer.

The Arctic cisco population near the West Dock has shown several changes. First, the early dispersal season of the westward movement of ciscoes may

sometimes be restricted by the presence of cool waters along the eastern side of the causeway. This is indicated by the large 1985 and 1986 catches at the east base of West Dock relative to those in the rest of Prudhoe Bay. In 1987, however, there appeared to be neither a delay in migration nor large numbers of fish "piling up" to the east of West Dock.

Some of the Arctic cisco on the east side of the causeway are diverted into Prudhoe Bay and the Sagavanirktok River delta. The abundance of Arctic cisco in Prudhoe Bay has increased. In the 7 years of study prior to the building of the West Dock causeway, from about 1969 to 1977, Arctic cisco were not abundant in Prudhoe Bay; they comprised only about 4 percent of the catch. Since construction of the West Dock causeway, Arctic cisco have comprised 31 to 70 percent of the fish catch.

The increase in the abundance of Arctic cisco in Prudhoe Bay may relate to a general concern that least cisco are no longer the most abundant anadromous fish in Prudhoe Bay. One possibility is that least cisco are no longer the most abundant simply because of the increase in abundance of Arctic cisco. This possibility is supported by the Comprehensive Marine Report, which states that no trends in anadromous populations were identified other than the above-mentioned changes in broad whitefish and Arctic cisco.

Third, because of the evidence that the westward migration of Arctic cisco is delayed by the West Dock in some years, the Arctic cisco population in the Colville River has been studied closely. There is concern also because of the

commercial and subsistence harvests in the Colville River. The harvests were dominated before West Dock construction by Arctic cisco of age 6-7 years. After West Dock was extended the harvests were dominated by older (9-year old) Arctic cisco, which indicated that maybe younger fish weren't reaching the Colville River. The recruitment to the Colville River is probably aided by easterly winds which pull coastal water and young Arctic cisco westward from the Mackenzie River. The recent pattern of recruitment into the population indicates that catch rates will remain low until the fall of 1990 or 1991, when the 1985 year class begins to enter the fishery. The catches are expected to remain stable for several years in the early to mid-1990's because young Arctic cisco showed strong recruitment into the region from 1985 to 1987. One reason that recruitment was poor during the early-1980's was frequent westwind conditions, which probably slowed or hindered movement of young fish from the Mackenzie River.

In summary, as a result of the West Dock causeway there have been changes in local abundance as shown by the slight decline in broad whitefish in the Sagavanirktok River and by an increase in Arctic cisco in Prudhoe Bay. Also, there have been changes in distribution as shown by the delay of Arctic cisco during their westward movement around the causeway, and by their diversion into Prudhoe Bay and the adjacent Sagavanirktok River delta.

ENDICOTT CAUSEWAY

The main part of the Endicott causeway extends 2.5 miles offshore to a causeway between two drilling islands. During the initial construction period, the causeway had temporary breaches. The outer breach included a 50-foot long bridge plus eight 6-foot diameter culverts; the nearshore breach included two small bridges plus twenty culverts. In 1986, a year after construction, the temporary breaches were replaced. The outer and inner breaches were lenghtened to 200 and 500 feet, respectively.

There is a large amount of environmental data on the Endicott causeway, including many Endicott Environmental Monitoring Program 1985 final reports, 1986 revised draft reports and 1987 draft reports. The reports include several on anadromous fish distribution, abundance, food habits, age, growth, overwinter habitats, mark-and-recapture movement studies, and surveys of the domestic and commercial fisheries in the Beaufort Sea. Unfortunately, there is not a comprehensive synthesis of the data on the anadromous fish around the Endicott causeway with its wide breaches. However, the following conclusions from these studies are examples of the documented effects.

First, the Endicott Environmental Monitoring Program reports include no evidence that Arctic cisco are "piling up" to the east of the Endicott causeway. Second, the water characteristics data from the active capture program for Arctic cisco are generally in agreement with those in pre-causeway studies and in studies from other parts of the Beaufort Sea.

Third, the Arctic char has shown a change in its migration route in the Sagavanirktok River. Since 1985, fall migrations of Arctic char into the Sagavanirktok River have not used the eastern channels of the river. This change is possibly related to the road to the Endicott causeway and the new bridge over the eastern channel of the river rather than to the causeway itself.

Fourth, the analysis of fish scales provide excellent data on both the pre-causeway and post-causeway growth conditions for fish. The 1987 Endicott monitoring report on age and growth concludes that the relationship between fish length and scale radius is linear throughout the range of sizes and species sampled in 1986. This indicates that pre-causeway and post-causeway growth conditions for fish, which are influenced primarily by temperature and food, have been similar.

In essence, the conclusions about the anadromous fishes around the Endicott causeway, which has relatively large breaches, appear to be descriptions of typical Beaufort Sea coastal conditions. The conclusions do not indicate any significant effects on distribution and abundance of anadromous fishes due to the Endicott causeway.

PROBABLE EFFECTS OF NIAKUK CAUSEWAY

On the basis of two lines of reasoning, we think that the type and magnitude of effects on anadromous fish of a Niakuk causeway may be similar to the documented effects of the Endicott causeway. One line of reasoning is that

the proposed Niakuk causeway will be breached similarly to the Endicott causeway. The Endicott causeway has a 500-foot nearshore breach and a 200-foot offshore breach in its 2.5 mile length. The proposed 1.25 mile Niakuk causeway has a 350-foot nearshore breach.

A second line of reasoning is based on the analysis of the probable oceanographic effects of the Niakuk causeway (see Attachment 2 to the MMS memorandum to U.S. Fish and Wildlife Service). First, the analysis concluded that the proposed breach in the Niakuk causeway is long enough to accomodate the outflow of the adjacent West Channel of the Sagavanirktok River. Second, the analysis concluded also that the volume of water that does flow through the 350-foot breach and the outflow from the adjacent West Channel of the Sagavanirktok River will probably be sufficient to maintain the nearshore water characteristics on both sides of the proposed causeway. Third, the analysis concluded that upwelling would affect only a small area (about 1 square mile) during strong, persistent east winds.

FISHERIES

The decision to permit the proposed Niakuk causeway should also take into consideration the relative importance of the fisheries for the area affected by the proposed causeway. These fisheries are relatively small and focused primarily in the Colville River delta. The only continuous commercial fishing operation on the entire North Slope is operated by a single family, the Helmericks, during the summer and fall months in the Colville River delta.

In addition, the village of Nuiqsut also harvests the same species targeted by the Helmericks' fishery. The average annual commercial harvest over the last 10 years was 22,300 Arctic cisco and 21,500 least cisco. The combined annual average harvest of both commercial and subsistence fishing was 48,500 Arctic cisco and 36,400 least cisco. Fish is the second most important subsistence resource harvested by Nuiqsut residents; fish represents about 20 percent of the resources harvested while, caribou represents about 75 percent.

The aforementioned effects to these species do indicate that these two fisheries in the Colville River delta should continue. Any annual variation in harvest or harvest effort would likely result from natural perturbations, such as changes in frequency of wind speed and direction.

SEP 7 1988

Memorandum

To: Regional Director, Alaska Regional Office, U.S. Fish and Wildlife Service

From: Regional Director, Alaska OCS Region, Minerals Management Service

Subject: Departmental Review of the Environmental Effects of the Niakuk Project Development

My office has conducted a review of the U.S. Army Corps of Engineers Public Notice of Application for Permit from Standard Alaska Production Company for the proposed expansion of offshore oil and gas facilities at Niakuk Island. Therefore, we are sending you our review and analysis of this permit application in order to facilitate Fish and Wildlife Service coordination of a Departmental review. We understand that your office is also preparing comments on this notice, and that you may want to schedule a meeting during the week of September 12 to 16 to resolve any differences. We would be willing to meet with you at your discretion. Tom Boyd of my staff has already been in contact with Rowan Gould and your Fairbanks field office.

We have closely followed the development of Beaufort Sea oil prospects and are encouraged by this proposed development of the Niakuk prospect. The development of marginal offshore fields in the nearshore Beaufort Sea is an important step in the development of prospects farther offshore, and hence has major implications for future OCS development and production.

In concept, the Minerals Management Service strongly supports this project, and we have reviewed both the economics and technical feasibility of the development alternatives (Attachment 1) and the probable environmental effects (Attachments 2 and 3). Summaries of these reviews follow. Please note that the reviews of the environmental effects concern primarily the probable oceanographic effects and effects on anadromous fish of the proposed solid-fill causeway with a 350-foot nearshore breach. Additionally, both of these reviews distinguish clearly the effects of a causeway with a relatively large breach, like Endicott and the proposed Niakuk causeways, from those of a causeway with a relatively small breach.

o Economics and Technical Feasibility of Field Development (Attachment 1): The Region's Resource Evaluation and the Field Operation's offices completed an independent analysis of the economics and technological feasibility of the proposed development alternatives. The economic analysis used the extensive geophysical and geological data that is made available to us by

industry, Standard's own assessment, and the State of Alaska's published reserves. Our analysis concludes that development with a solid-filled and breached causeway is the least expensive of the proposed alternatives. While the project as proposed may be economically viable, relatively small additional costs will render it uneconomic, thus depriving the nation of an additional source of domestic energy.

Concerning the technical feasibility, the causeway appears to be the best option. Subsea pipelines and directional drilling are technically feasible; however, these options present risky undertakings. The location and configuration of the Niakuk reservoir are not as amenable to directional drilling as the Lisburne reservoir. The access, safety, and maintenance considerations make subsea pipelines less desirable.

o Probable Environmental Effects--Oceanographic Conditions (Attachment 2): This office's Leasing and Environment office completed a review of the probable changes in water characteristics and quality due to the proposed development. This review concludes, first, that the proposed 350-foot breach in the Niakuk causeway will be long enough to allow the nearshore movements of fish and to accommodate the outflow of the adjacent West Channel of the Sagavanirktok River. Second, the breach will maintain similar nearshore water characteristics on both sides of the proposed causeway. Third, the tongue of brackish water which extends offshore across Prudhoe Bay might be changed slightly in water characteristics. These changes would occur primarily from east winds which would cause a weak upwelling of slightly colder and higher salinity water on the west side of the proposed causeway. The area of this tongue of brackish water is about 1 square mile.

o Probable Environmental Effects--Anadromous Fish Habitat (Attachment 3): The Leasing and Environment office's analysis of the probable effects on anadromous fish reviewed the documented effects associated with West Dock and those associated with Endicott. The Endicott Environmental Monitoring Program has shown that the anadromous fish populations around this causeway appear to be similar to typical Beaufort Sea coastal populations. The conclusions do not indicate any significant effects on distribution and abundance of anadromous fish due to the Endicott causeway with its large breaches. The effects of the proposed Niakuk causeway with a large, nearshore breach should be similar.

The review also considered the size of the locally-important commercial and subsistence fisheries in the Colville River delta. Our view is that decisions about the Niakuk Project Development should also consider the relative importance of these fisheries. The combined annual average harvest of both commercial and subsistence fishing is about 48,000 Arctic cisco and 36,000 least cisco. We have concluded that these fisheries would continue with the addition of the proposed Niakuk causeway.

Lastly, we believe that the need for additional information on the effects of causeways on anadromous fish habitat should be limited to synthesis of the extensive anadromous fish data on breached causeways and to answers for a few

specific oceanographic hypotheses. An expensive monitoring program similar to that conducted at Endicott could add prohibitive costs to the proposed Niakuk project and render it uneconomical.

In summary, we support the development of the Niakuk project as proposed. We believe that the adverse environmental effects will be small whereas the production resulting from the Niakuk project will be a significant contribution to the Nation's domestic energy production. Furthermore, each additional energy project in the vicinity of Prudhoe Bay may assist prospective development on the OCS.

original signed by

Alan D. Powers

3 Attachments

Attachment 1

Minerals Management Service memorandum dated September 7, 1988 to the U.S. Fish and Wildlife Service

SUMMARY OF MINERALS MANAGEMENT SERVICE'S
ANALYSIS OF THE RESOURCE ECONOMICS AND TECHNICAL FEASIBILITY
OF THE NIAKUK DEVELOPMENT ALTERNATIVES

Resource Economics: The MMS review of the economics of the Niakuk Project Development incorporated Standard's environmental assessment reserves, State of Alaska published reserves, and an internal geological and geophysical estimate of resource potential. Developmental cost data from the environmental assessment was reviewed and compared to our own cost estimates. Due to the proprietary nature of the analysis and data, no detailed report is provided. The following paragraph is the conclusion of this independent economic assessment of the Niakuk Project alternatives.

The MMS review indicates that building a breached causeway is the lowest cost option and offers many operational, logistical and safety-oriented advantages. The subsea pipeline option is the next lowest cost option, but lacks the year-round mobility that the causeway provides. The elevated-bridge causeway is prohibitively costly. The remaining options either lack advantages or are not supported with proven technology, and therefore have significant risk.

Technical Feasibility: The MMS analyzed the technical feasibility of the major development options (other than solid fill causeways) for a nearshore Beaufort Sea field such as Niakuk. Included in the technical analyses are extended reach drilling from an onshore site, and subsea pipeline transport

versus construction of a solid fill causeway with an elevated pipeline. This technical feasibility discussion is based on past North Slope development project proposals (offshore Lisburne, etc.), case histories, and technical descriptions of projects which outline the limits of the technology used for offshore field development projects.

Regarding onshore extended reach drilling, our analysis indicates that the technology probably exists to drill wells with the necessary departures from vertical to exploit the Niakuk field from an onshore location. However, there does not appear to be sufficient reservoir knowledge or information to define geologic or engineering control to confidently pursue a shore based directional well development program at Niakuk. Past development via wide departure drilling has been limited to fields with extensive reservoir knowledge, as a means of reaching difficult areas of the reservoir (in-fill drilling) and in response to other reservoir enhancement needs (pressure maintenance, reduce coning, etc.), and remains relatively untested for primary development drilling (exploiting a new reservoir). Unlike the Lisburne project, which would use high deviation wells to reach and produce an offshore portion of the reservoir from 3 strategic onshore locations (in place of a causeway and offshore island), the location and configuration of the Niakuk reservoir relative to a potential onshore site is not as accessible or amenable to a high deviation well development program. The analysis also concludes that the inability to predict reservoir performance with wide departure wells makes such development a risky undertaking.

While there is considerable technology available for drilling high deviation wells, such wells are inherently higher risk than more conventional vertical wells. High deviation wells are more susceptible to well control problems, lost circulation, establishing cuttings returns to the surface, greater casing wear, potential inability to set casing to target depth or to run the various logs necessary for identifying geologic/engineering control of the reservoir for efficient development. Accordingly, high deviation wells are more expensive to drill. Further, in the absence of geologic/engineering control of the reservoir, the method and type of completion to optimize production is unknown, and could result in unsuccessful wells. This also increases the cost and risk of the project.

For the subsea pipeline development option considered, we believe the technology exists, but remains untested, especially in the U.S. Beaufort Sea where no such development has occurred. Costs, access, safety, maintenance considerations, and the local unavailability of dedicated equipment to perform arctic subsea pipeline installation (trenching, etc.) make this option undesirable.

Attachment 2

Minerals Management Service memorandum dated September 7, 1988 to the U.S. Fish and Wildlife Service

MINERALS MANAGEMENT SERVICE'S
ANALYSIS OF THE OCEANOGRAPHIC EFFECTS
OF THE PROPOSED NIAKUK PROJECT DEVELOPMENT

The following represents MMS's analysis of the probable oceanographic effects of the proposed Niakuk Project Development based on information in the U.S. Army Corps of Engineers Public Notice of Application for Permit and on Standard Alaska Production Company's Environmental Assessment of the Niakuk Project Development.

This analysis considers in-depth only the proposed alternative which consists of a solid-fill causeway with a 350-foot nearshore breach. The alternatives which do not require a solid-fill causeway are (1) pile-supported pipelines, (2) subsea (buried) pipelines and (3) nearshore, extended-reach drilling. The oceanographic effects of these latter three alternatives, which are limited to the effects of an offshore island, appear negligible.

The possible oceanographic effects of the proposed causeway have been determined primarily on the basis of two recent causeway monitoring reports that were prepared for the US Army Corps of Engineers (USACOE): the Comprehensive Marine Report for the Prudhoe Bay Waterflood Project (USACOE, 1988) and the 1987 Endicott Environmental Monitoring Program draft reports on oceanography

(Short, et al., 1988). Another useful report has been the Environmental Assessment for the Lisburne Offshore Project (Dames and Moore, 1988) that was prepared for submission to the USACOE.

Two oceanographic aspects are analyzed, both of which are important to the quality of anadromous fish habitat around the Niakuk development project. First, the possible influence of the breached causeway on the continuity of the band of nearshore water is examined. This band is important for the alongshore movement of anadromous fishes. Second, the possible extent of upwelling in the lee of the causeway is examined. The upwelling influences the water characteristics and quality in the anadromous fish foraging habitat. The analysis of upwelling includes an examination of the possible cumulative oceanographic effects that the proposed causeway will add to the existing conditions around the adjacent causeways.

THE NEARSHORE BAND OF WATER

The continuity of water characteristics in the nearshore band of water influences the alongshore movement of anadromous fish. The continuity may be affected by the proposed solid-fill causeway with a 350-foot breach. Three questions about the breach length will be considered. First, is the breach long enough to allow the alongshore movements of fish? Second, is the breach long enough to accomodate the outflow of the Sagavanirktok River, which is important for maintaining the characteristics of the nearshore water? Third, is the breach long enough to accomodate all of the alongshore movement of water during steady east or west winds?

Is the breach long enough to allow the alongshore movements of fish? At an adjacent causeway, the West Dock, 50 percent of the fish moving past the causeway go through a 50-foot long breach. Furthermore, the adjacent Endicott causeway included relatively small breaches during construction. The offshore breach was eight 6-foot diameter culverts plus a 50-foot bridge, and the nearshore breach was two small bridges plus 20 culverts. Anadromous fishes moved through these temporary breaches as indicated by the absence of significant changes in anadromous fish distribution and abundance during the initial year of the Endicott Monitoring Program, when the temporary breaches were still in place. The breaches in these examples are much shorter than the proposed 350-foot breach in causeway for Niakuk. Therefore, the proposed breach in the Niakuk causeway should be long enough to allow the alongshore movements of fish.

Is the breach long enough to accomodate the outflow of the Sagavanirktok River? The peak discharges in the West Channel of the Sagavanirktok River, which is the channel near the proposed Niakuk causeway, have been measured since 1985 (Johannessen, 1988). The flow during the summer, open-water period is generally low compared to the spring over-ice discharge from the river. The spring over-ice discharge has been observed to flow over even the river banks. However, the summer flow is high only during rain storms. The highest rate of discharge, which occurred during a rain storm in 1987, was 501 cubic meters/second. All of the water during the peak discharge flowed through the breach in the road over the West Channel that goes to the Endicott causeway. The breach is twelve 6-foot diameter culverts. The culverts have a total area of less than one-fourth of the area that will be filled by water under the

proposed 350-foot Niakuk breach. So, the proposed breach in the Niakuk causeway appears to be long enough to accomodate the outflow of the adjacent West Channel of the Sagavanirktok River.

Is the breach long enough to accomodate all of the alongshore movement of water during steady east or west winds? This question is a more difficult one to answer. There are indications of strong currents at the tip of Heald Point, the location of the proposed causeway. The circulation near the tip during easterly winds is summarized and illustrated clearly in the Environmental Assessment for Lisburne Offshore Project (Dames and Moore, 1988). During easterly winds, there is a rapid flow to the west around Heald Point into Prudhoe Bay (see Attachment a, Figure 3-8 from Dames and Moore, 1988). The rapid alongshore flow at Heald Point is shown also by the current vectors from a current meter mooring just north of Heald Point (Hachmeister, et al., 1987).

There is probably a rapid flow to the east around the tip of Heald Point during westerly winds, also. The temperature characteristics of the water indicate that there is a rapid flow of relatively warm surface water out of Prudhoe Bay around Heald Point (Attachment b, Figure 4-2 from Dames and Moore, 1988).

The rapid currents at the tip of Heald Point appear to have scoured the seabottom deeply (Attachment c, Figure 3 from Standard Alaska Production Company, 1988). The current scour depression extends alongshore about three

times the distance that it extends offshore, which is unlike the circular, "strudel" or under-ice scour depression that is located south-southeast of Heald Point (Attachment c). The attachment shows that the onshore-offshore width of the current scour depression, as defined by the 4-foot isobath, equals approximately 650 feet. Since 350 feet is the total length of the proposed breach in the 1.25 mile Niakuk causeway, the breach will probably restrict the alongshore flow of nearshore water during steady east or west winds. However, the volume of water that does flow through the 350-foot breach and the outflow from the adjacent West Channel of the Sagavanirktok River will probably be sufficient to maintain the nearshore water characteristics on both sides of the proposed causeway, as indicated by the water characteristic around the temporary breach in Endicott. There will probably not be sharp temperature or salinity changes in the nearshore water adjacent to the causeway.

UPWELLING IN ANADROMOUS FISH FORAGING HABITAT

During sustained easterly winds, offshore bottom water upwells in the lee (westside) of causeways (Attachment d, Plate 1 from Short, et al., 1988). The characteristics and magnitude of the upwelling in the lee of the proposed Niakuk causeway can be reasonably predicted using bottom water characteristics near the Niakuk artificial island at the end of the proposed causeway. Examples of the bottom salinity characteristics near Niakuk during early August are included in the 1987 Endicott Environmental Monitoring Program draft reports (Attachment e, Figure 23 from Short, et al., 1988). During this time the bottom salinity typically equalled 12 to 16 parts per thousand near

the end of proposed Niakuk causeway. This salinity range was similar to the salinity of bottom water which upwells weakly along the outer part of breached Endicott causeway. It is interesting to note that the bottom water at end of West Dock, which has very small breaches for fish passage, was over 28 parts per thousand. The upwelling on the west side of West Dock is characterized as highly marine. The characteristics of the water which may upwell in the lee of the proposed Niakuk causeway with a 350-foot breach would likely be similar to the water which upwells in the lee of Endicott causeway but will probably not be similar to water upwelling near West Dock.

The oceanographic effect of this weak upwelling in the lee of the proposed Niakuk causeway with a 350-foot breach can be projected. Presently, sustained easterly winds pull a tongue of relatively warm, brackish water across the offshore, outer part of Prudhoe Bay (Attachment b and d). With the proposed causeway and 350-foot of breaching, the integrity of this tongue of brackish water would probably be maintained. However, the causeway would create weak upwelling during sustained easterly winds which, given the bottom temperature and salinity near the drilling island, may reduce slightly the temperature and increase salinity of the tongue of water. The northeast portion of the tongue which extends offshore across Prudhoe Bay might be changed slightly in water characteristics during sustained easterly winds. The width and alongshore length of this tongue equals about 0.5 and 2 miles, respectively, so the area equals about 1 square mile.

CONCLUSION

This analysis leads to following conclusions. First, the proposed breach in the Niakuk causeway should be long enough to allow the alongshore movements of fish. Second, the proposed breach in the Niakuk causeway is long enough to accomodate the outflow of the adjacent West Channel of the Sagavanirktok River. Third, the breach will probably restrict the alongshore flow of nearshore water during steady east or west winds, causing upwelling. However, the volume of water that does flow through the 350-foot breach and the outflow from the adjacent West Channel of the Sagavanirktok River will probably be sufficient to maintain the water characteristics of the nearshore water on both sides of the proposed causeway. Fourth, the tongue of brackish water which extends offshore across Prudhoe Bay during steady east winds might be changed slightly in water characteristics (temperature and salinity). The area of this tongue equals about 1 square mile.

REFERENCES

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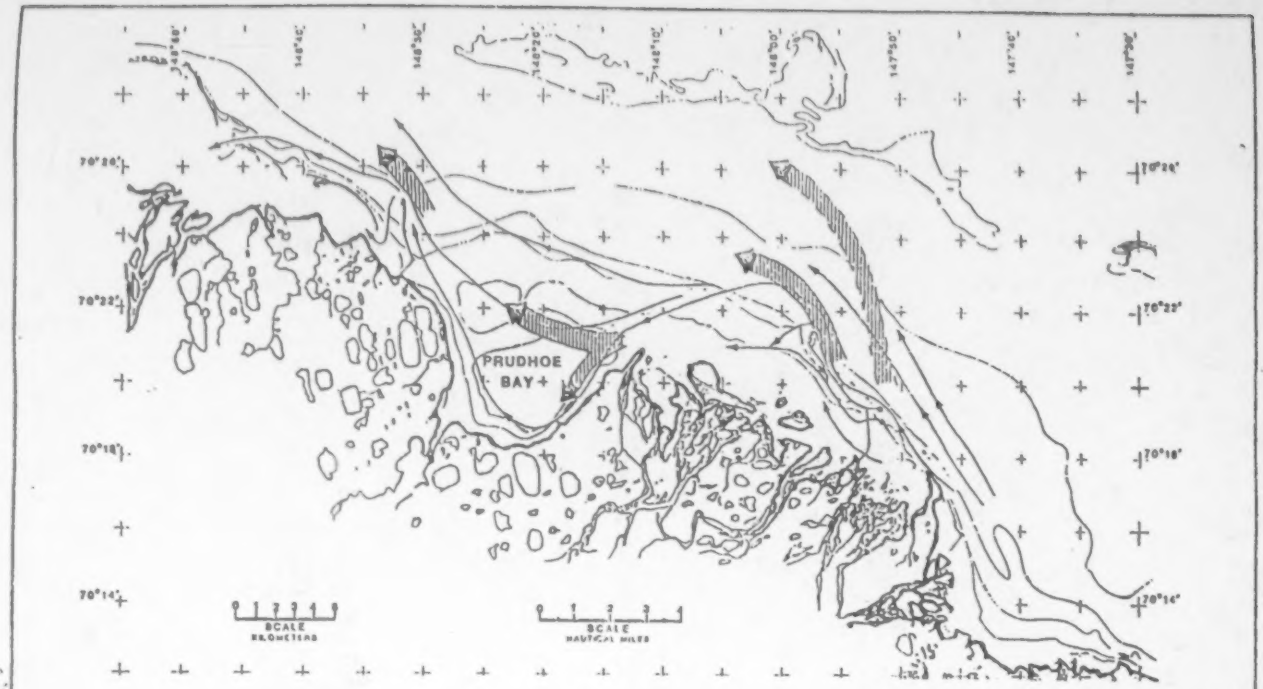
5 Attachments



NOTES:

Flow patterns inferred from hydrographic/satellite data.

Streamlines determined from current meter data.

FIGURE 3-8

Idealized Regional Circulation Under Easterly Winds

SOURCE: SHORT ET AL. 1987

LISBURNE OFFSHORE PROJECT ENVIRONMENTAL DOCUMENT

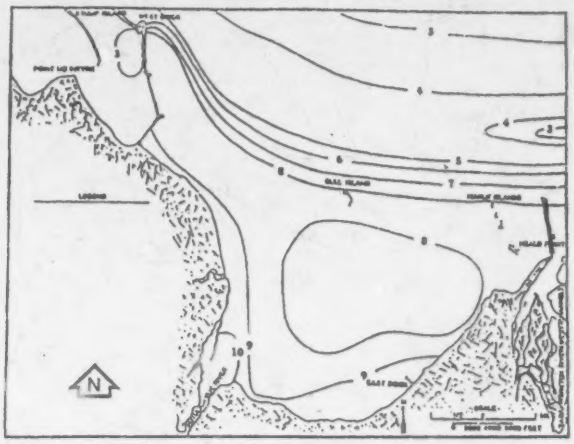
LISBURNE OFFSHORE PROJECT
ENVIRONMENTAL ASSESSMENT

prepared by DAMES & MOORE

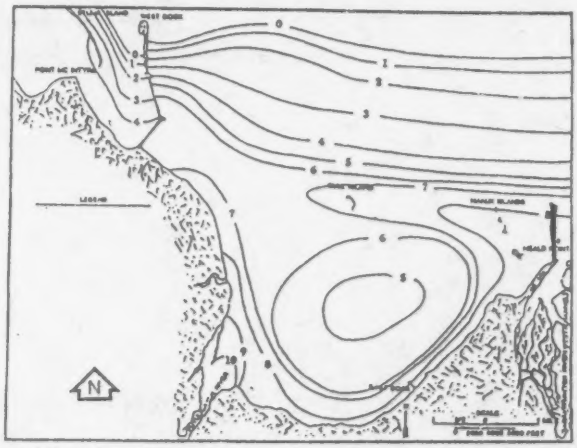
for
ARCO ALASKA, INC.
EXXON USA and STANDARD
ALASKA PRODUCTION COMPANY

July 1988

Dames & Moore

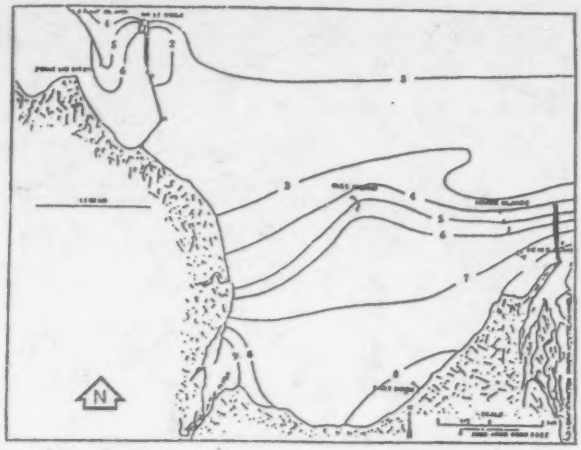


a. Surface Temperature

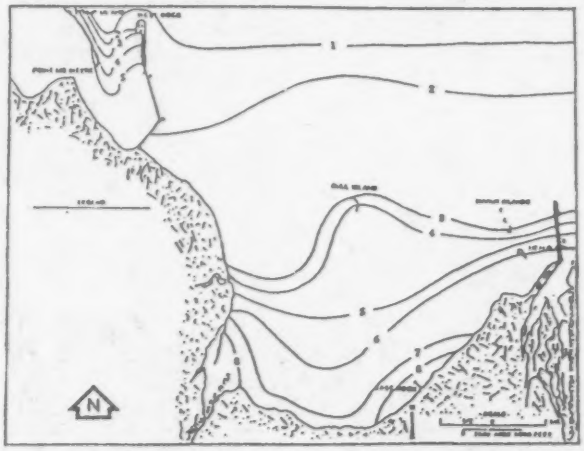


b. Bottom Temperature

FIGURE 4-2
Surface and Bottom Temperature (oC)
for E-SE Winds - Existing Conditions



a. Surface Temperature



b. Bottom Temperature

FIGURE 4-12

Surface and Bottom Temperature (^{o}C) Maps for Westerly Wind Preceded By an Easterly Upwelling Event - Existing Conditions.

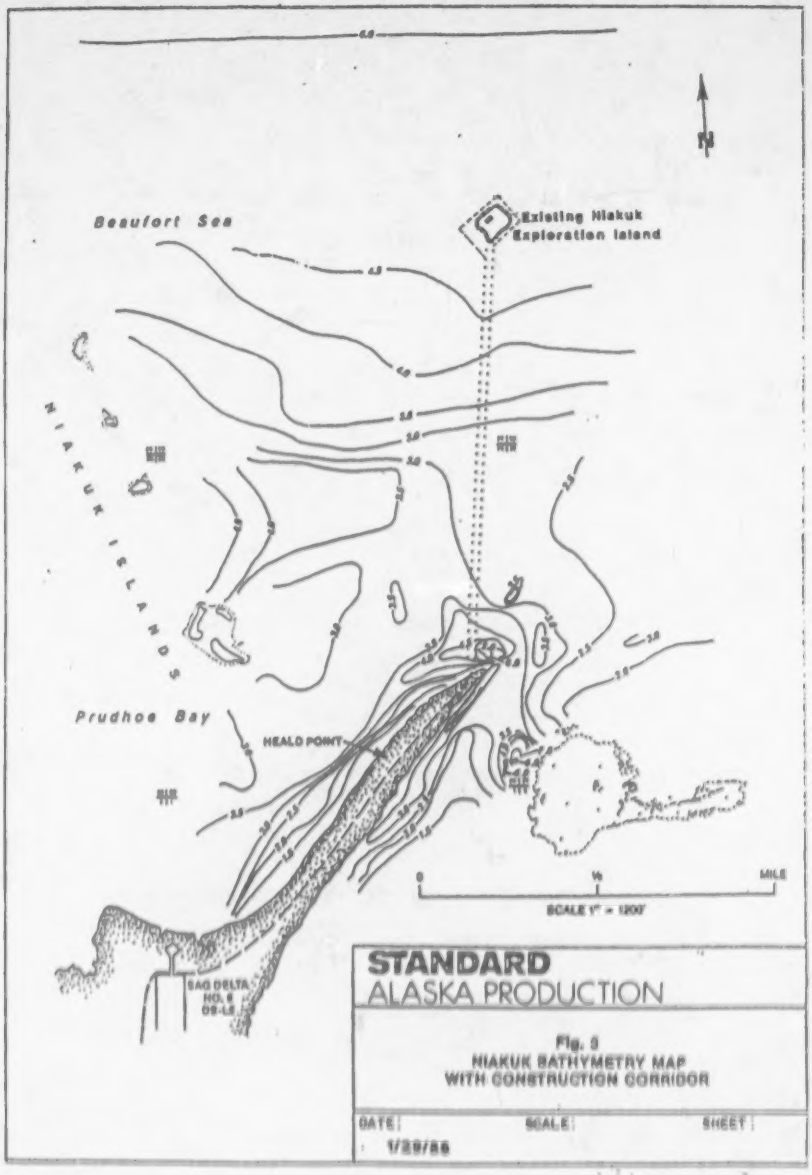
LISBURNE OFFSHORE PROJECT
ENVIRONMENTAL ASSESSMENT

prepared by DAMES & MOORE

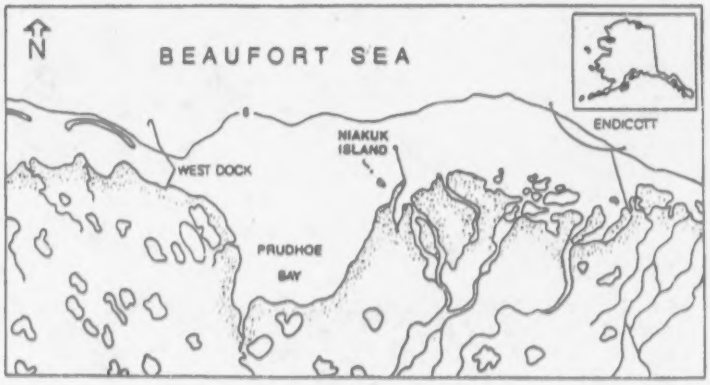
for
ARCO ALASKA, INC.
EXXON USA and STANDARD
ALASKA PRODUCTION COMPANY

July 1988

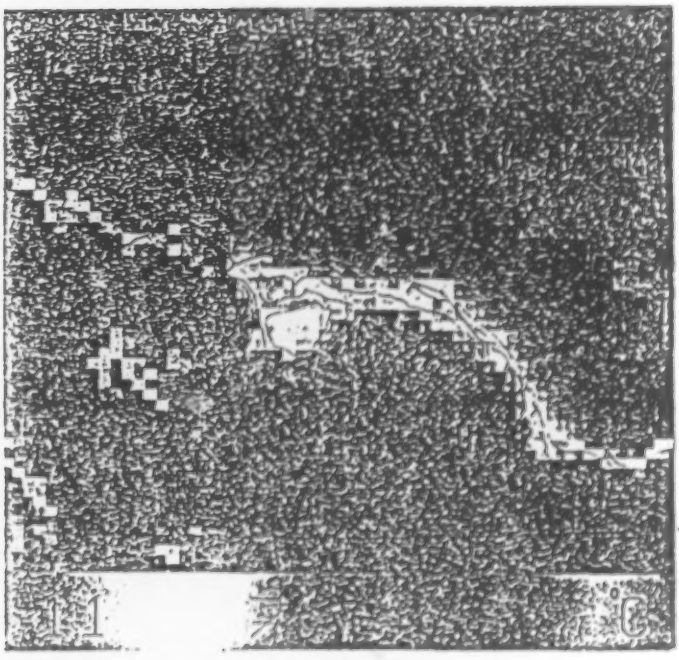
Dames & Moore


Beaufort Sea
Existing Niakuk
Exploration Island
NIAKUK ISLANDS
Prudhoe Bay
HEALD POINT
SAG DELTA
NO. 6
09-18
0
½
MILE
SCALE 1" = 1200'
STANDARD
ALASKA PRODUCTION
Fig. 3
NIAKUK BATHYMETRY MAP
WITH CONSTRUCTION CORRIDOR
DATE
1/29/86
SCALE
SHEET

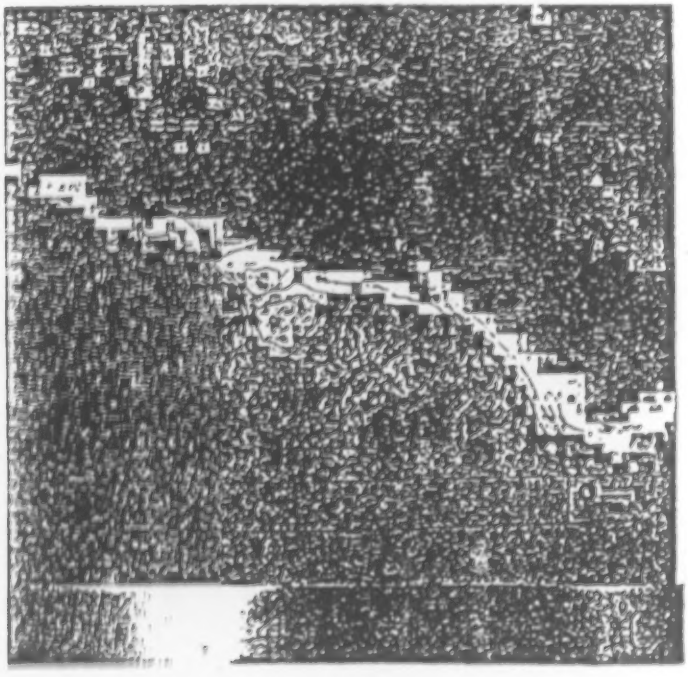
NIAKUK PROJECT DEVELOPMENT
BEAUFORT SEA, ALASKA



STANDARD
ALASKA PRODUCTION



a. 3 August 1987. East wind conditions.



b. 11 August 1987. East wind conditions.

Plate 1. Endicott 1987 Oceanographic Monitoring Program, NOAA AVHRR Band 4 Digitally Enhanced Images.

1987 Endicott Environmental Monitoring Program

Draft Report

Oceanography

Kent S. Short
Carol D. Janzen
Calvin J. Van Zee
Dennis J. Hanzlick
Envirosphere Company

ENVIROSPHERE COMPANY
Anchorage, Alaska

March 1988

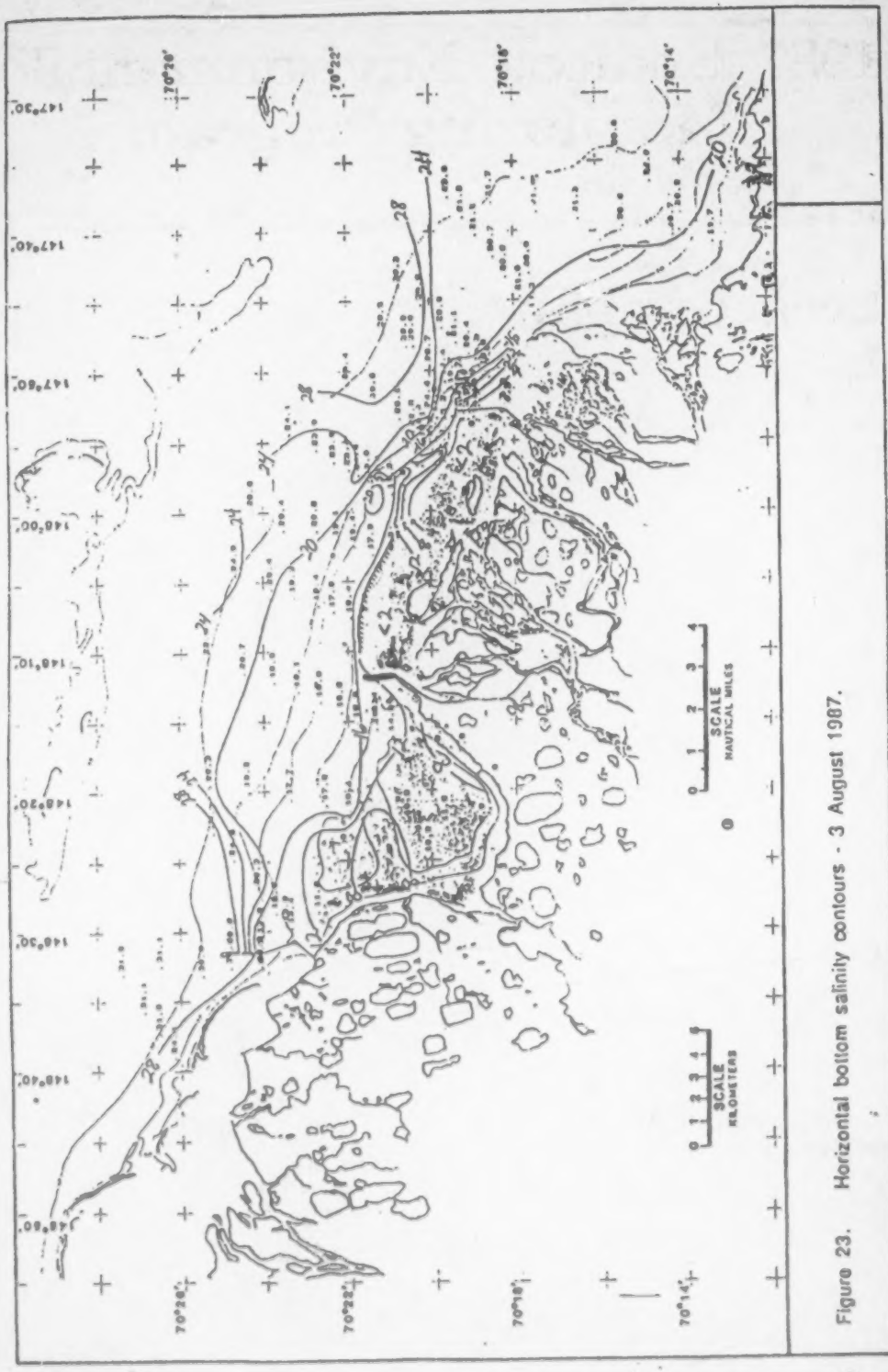


Figure 23. Horizontal bottom salinity contours - 3 August 1987.

EPA 910/0-88-218

United States
Environmental Protection
Agency

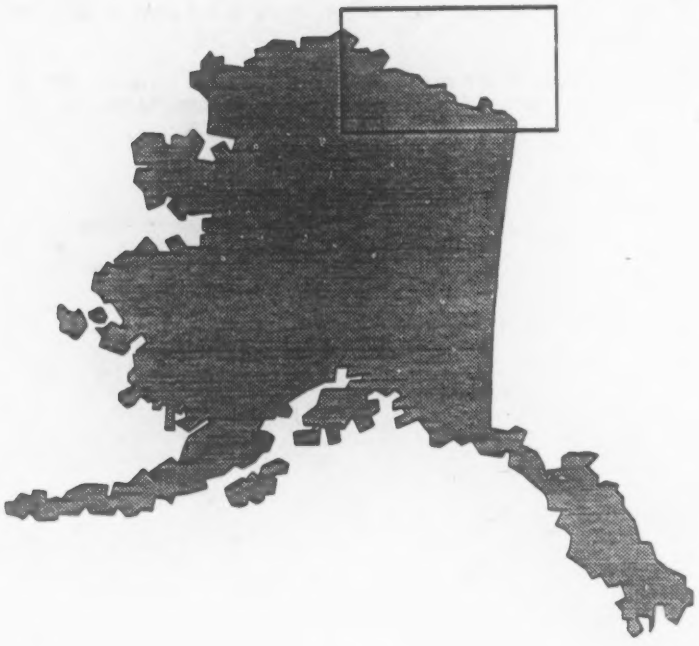
Region 10
1200 Sixth Avenue
Seattle,WA 98101

October 1988

Alaska Operations Office - Anchorage

EPA

Causeways in the Alaskan Beaufort Sea



U.S. ENVIRONMENTAL PROTECTION AGENCY

ALASKA OPERATIONS OFFICE
Room E535, Federal Building
701 C Street, Box 19
Anchorage, Alaska 99513
Phone (907) 271-5083

November 16, 1988

Dear Colleague:

I am pleased to provide for your use and information the attached EPA report entitled "Causeways in the Alaskan Beaufort Sea." This report describes the existing Prudhoe Bay area causeways and provides a general overview and synthesis of monitoring program results. Discussions focus on the impacts and risks associated with these large nearshore structures.

A limited number of additional copies are available from this office. The report will also be available soon through the National Technical Information Service.

Sincerely,

Alvin L. Ewing
Assistant Regional Administrator

Enclosure

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA 910/9-88-218	2.	3. Recipient's Accession No.
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15. Supplementary Notes

16. Abstract (Limit: 200 words)

This report reviews information from several years of permit-required field monitoring of the physical and biological effects of solid-fill gravel causeways in the Beaufort Sea near Prudhoe Bay, Alaska. The shallow nearshore zone of the Beaufort Sea coast in the Prudhoe Bay area functions biologically as an estuary. Area anadromous fish rely heavily upon the comparatively moderate estuarine conditions in this zone. This zone represents critical rearing habitat for the anadromous fish, as 90 percent or more of their feeding for the entire year occurs here during an 8 to 12 week ice-free summer season. Prudhoe Bay area causeways have been constructed across this critical zone, degrading the nearshore estuarine environment by: 1) deflecting fresh and brackish water masses offshore, resulting in the loss of thermal energy and freshwater from the nearshore; 2) causing enhanced upwelling and intrusion of marine water directly into the nearshore zone in replacement of the deflected estuarine water; and 3) affecting local ice dynamics. Overall, fundamental alterations in nearshore water quality and circulation patterns have occurred along as much as 65 kilometers of coastline. These physical effects increase the risks that populations of anadromous fish will be seriously affected by increased overwinter mortalities, reduced growth and fecundity, and/or delayed maturation. Evidence that these impacts may already have begun to occur is discussed. Construction of additional causeways in the area would further increase these risks.

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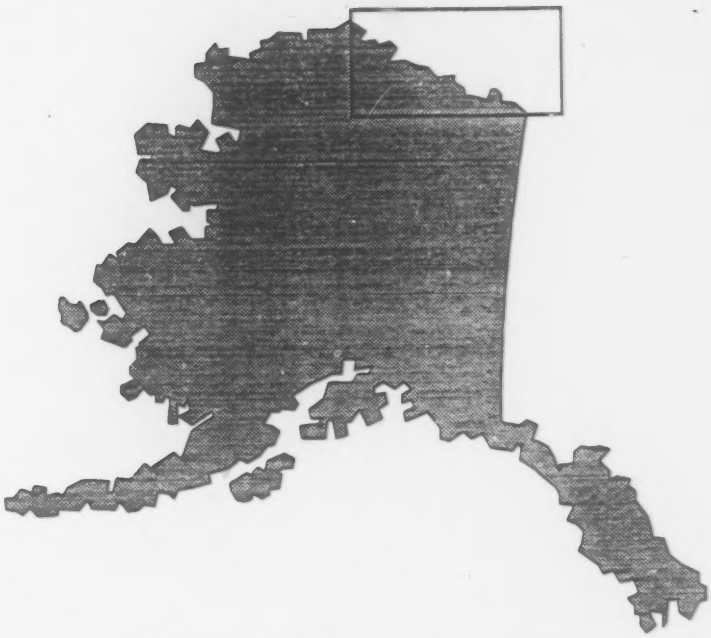

United States Environmental Protection Agency
Region 10

Causeways in the Alaskan Beaufort Sea

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October, 1988

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Many people contributed their time, advice, and expertise to this document. Helpful comments about technical content were made by several reviewers, too numerous to list here. The efforts of each are greatly appreciated. Linda Sewright's technical editing skills were particularly helpful in making complicated topics as understandable as possible. Finally, the graphics and publishing abilities of Eric Meyerson and Christopher Moffett were nothing short of heroic, especially considering the condition of the draft document and the impossible schedule. Grateful acknowledgement is extended to all.

ABSTRACT

Prior to the construction of major gravel causeways in the central Beaufort Sea, the shallow (<2 m) nearshore environment of the Prudhoe Bay area (including a nearby lagoon system and two river deltas) was dominated in the summer by a band of brackish, relatively warm estuarine water. These estuarine conditions were generally continuous along the nearshore during both east and west winds. Conditions in this band represent the most productive feeding and rearing habitat for the Arctic anadromous fish of the region. During prevailing easterly winds, the West Dock causeway deflects the estuarine water offshore. The deflected water mixes more directly with offshore marine water and rapidly loses its estuarine character. At the same time, the deflected water is replaced by upwelled marine water which then dominates the Stump Island Lagoon-Gwydyr Bay complex. This upwelled water causes a large area to be unsuitable as feeding habitat for many anadromous fish, and severs the nearshore band of estuarine habitat. These alterations to the natural environment cause fish migration to be delayed, and fish to be isolated from unaffected habitat areas to the east and west. Upon shifts to west winds, the marine water upwelled into the lagoon system flows around the causeway into Prudhoe Bay, forcing anadromous fish rearing there to retreat toward river delta fronts for refuge. The Endicott causeway also deflects the brackish coastal plume offshore. Similar to the West Dock causeway, the Endicott causeway induces upwelling of marine water downwind from the structure. This separates Sagavanirktok River water in the nearshore from the diverted coastal water mass. In this manner, the brackish coastal water mass and the fresh river water each mix more directly with marine water. These processes bring about an overall degradation of nearshore estuarine water quality, and hence habitat value. Cumulatively, the West Dock and Endicott causeways have fundamentally altered circulation patterns and water quality across approximately 65 kilometers of the central Beaufort Sea coast. These major changes in the physical environment place populations of anadromous fish, and the commercial and subsistence fisheries that rely upon them, at substantial risk. Indicators from causeway monitoring programs show that fish are being affected by these habitat changes; and it is possible that significant population declines have already begun to occur.

EXECUTIVE SUMMARY

Overview

The nearshore zone of the Prudhoe Bay area functions biologically as a coastal estuary. The warm, brackish water conditions found across the area are more biologically productive than the fresh or marine waters. Because of this productivity, the area is critical for the anadromous fish of the central Beaufort Sea which are dependent upon estuarine conditions for feeding and rearing. However, despite the productivity of this estuarine habitat, the harshness of the Arctic environment and the short summer season cause these fish populations to be slower growing and maturing than more southern populations.

By disrupting circulation patterns and altering the balance of fresh and marine water, the existing causeways have significantly affected water quality across approximately 65 kilometers of the central Beaufort Sea. The water quality alterations have reduced the quantity and quality of estuarine habitat. These causeway-induced changes decrease the ability of anadromous fish to obtain sufficient energy for overwintering survival, growth, and reproduction. Although the risk of population-level impacts from these changes cannot presently be quantified, several indicators from environmental monitoring programs suggest there is a substantial risk of significant population-level impacts over the life of the causeways. Eventually, existing causeways could seriously disrupt the coastal fish community and harm subsistence and commercial harvests in Canada as well as in Alaska. Restoration of circulation patterns similar to the pre-causeway environment is necessary to reduce the impacts to water quality and fish habitat. In contrast, additional causeways proposed for the area would significantly increase these impacts and risks.

Introduction

Prudhoe Bay is located on the central Beaufort Sea coast approximately halfway between Point Barrow and the Alaska-Canada border. Considerable industrial activity has occurred in the general Prudhoe Bay area, as it is the hub of the largest producing oil field in the United States and the origination point for the 1,300-kilometer long Trans Alaska Pipeline System. This industrial activity has spread into nearby offshore waters as well, and three gravel causeways have been constructed in the area. Two of these - the West Dock causeway and the Endicott causeway - extend four kilometers or more from shore and have been the subject of considerable controversy both prior to and since their construction.

The primary concerns about the gravel structures are their impacts to nearshore water quality and circulation patterns, and, consequently, the quality of habitat for the anadromous fish populations of the region. These fish are an important resource for subsistence users in both Alaska and Canada. During the brief summer period when the Beaufort Sea is not frozen, the fish are generally constrained to the immediate nearshore zone where inhospitable marine conditions are displaced by warmer, brackish waters. It is across this same critical nearshore zone that the causeways have been constructed, disrupting nearshore circulation patterns and causing the estuarine habitat to be replaced by offshore marine water along many kilometers of coastline.

The impacts and risks posed by Prudhoe Bay area causeways are significant. The Alaska District, U.S. Army Corps of Engineers, has declared the impacts of the Endicott causeway unacceptable and is considering mitigation measures. This report has been prepared as a basis of support for decisions about mitigation at both the Endicott and West Dock causeways. The report summarizes the current state of knowledge about the nearshore environment and the impacts of causeways in the central Beaufort Sea.

Environmental Setting

For 1 to 8 kilometers out from shore in the Prudhoe Bay area, the Beaufort Sea is extremely shallow - less than 2 meters deep. This includes the broad Sagavanirktok River delta and the coastal lagoon system to the west. During each winter, these areas freeze completely to the bottom and cannot serve as feeding and rearing habitat for anadromous fish for about nine months. Open surface water is found only during a few weeks in the summer. Due to the extreme shallowness of the nearshore, summer water currents are determined by the wind. The direction of the current, in turn, plays a large role in determining water quality in the area.

During summer, warm, fresh water from rivers in Canada and Alaska mixes with cold offshore marine water to form a nearshore band of brackish water, the "coastal water mass." This mass of brackish water flows east or west along the Beaufort Sea shoreline depending on the direction of the prevailing winds. The Sagavanirktok River is a major local source of fresh water input to the coastal water mass, maintaining and enhancing the estuarine habitat of the Prudhoe Bay area.

Satellite images and hydrographic surveys provide evidence that prior to the construction of the causeways, the nearshore's estuarine conditions were generally continuous across the Prudhoe Bay area. Although the coastal water mass behaved somewhat differently under easterly versus westerly winds, the integrity of the estuarine band could be maintained in either case.

Biologically, this nearshore estuarine zone is the most critical feature of the summer coastal aquatic environment. Here, the harsh conditions of the Arctic Ocean - inhospitable for many organisms - are moderated by a combination of increased solar warming (due to shallowness), lower salinities, and terrestrial as well as marine nutrient sources. Productivity in this zone is higher for phytoplankton, aquatic plants, invertebrates, and fish than it is in adjacent marine or freshwater environments. The anadromous fish of the region are particularly dependent upon these more moderate and productive estuarine conditions.

Numerically dominant anadromous fish species in the Beaufort Sea include Arctic cisco, least cisco, broad whitefish, and Arctic char. These fish support subsistence fisheries in both the United States and Canada, and play an ongoing role in the native cultures of the American Arctic. Arctic cisco in particular are an international resource, with the individuals from the same population being harvested in both the Alaskan Beaufort Sea and throughout the Mackenzie River drainage in Canada. All of the anadromous fish must obtain the vast majority (90 percent or more) of their energy intake for the entire year during the very limited period of open water. The feeding and rearing period is so limited (approximately 10 weeks) that these populations naturally grow and mature more slowly than related populations and species from more temperate areas. In addition, the ability to acquire energy rapidly is so limited that these fish are unable to spawn in consecutive years. Even though food organisms may be abundant, energy is clearly a limiting factor.

Temperature and salinity are extremely important in determining the overall quality of habitat for these fish. Typical marine conditions in the Arctic are extreme - a combination of both very cold temperatures and high salinities. These conditions are energetically adverse and generally represent unsuitable habitat conditions. The amount of time that suitable temperature and salinity conditions are available for rearing is of paramount importance. A reduction in the amount of foraging time will affect the scope for growth for that year. "Mild" years, when estuarine conditions persist in the nearshore zone longer than average, can naturally result in higher productivity and greater fish growth overall. Conversely, "harsh" years reduce growth potential because lowered temperatures slow assimilation rates at the same time that higher salinities invoke additional metabolic demands. If conditions are severe, the fish will not be able to accumulate sufficient energy reserves to survive the overwintering period.

In the absence of causeways, estuarine conditions were spread throughout the broad, shallow areas of the central Beaufort Sea including Foggy Island Bay, the Sagavanirktok River delta, Prudhoe Bay, and the lagoon system to the west. In this habitat, fish could presumably feed efficiently, with high assimilation and growth rates, and with a minimum of metabolic cost. This allowed net energy gains to be maximized over the very short summer, which in turn supported normal rates of growth, reproduction, and overwintering survival.

Causeway Projects

Development of oil and gas reserves on Alaska's North Slope has resulted in the construction of two massive, solid-fill gravel causeways into the Beaufort Sea. The West Dock causeway extends approximztely 4 kilometers offshore from the northwestern corner of Prudhoe Bay. A single, 15-meter (50-foot) opening or "breach" was constructed in the West Dock causeway in an attempt to allow anadromous fish to pass the structure. The nearly 8 kilometer long Endicott causeway is located in the middle of the Sagavanirktok River delta just east of Prudhoe Bay. It includes a total of 215 meters (700 feet) of breaching that was intended to allow fish passage as well as to mitigate the water quality impacts predicted by the Environmental Impact Statement (EIS) for the project.

Additional causeways have been proposed by the petroleum industry. The Lisburne causeway would have extended over 4 kilometers into the center of Prudhoe Bay to access a proposed drilling island. This proposal was recently withdrawn in favor of directional drilling from shore. The most recent proposal with a causeway is the Niakuk project. This proposal includes construction of a 2.2 kilometer long solid-fill causeway from Heald Point, at the northeastern end of Prudhoe Bay, to a man-made drilling island.

The primary concerns about these gravel structures center on their impacts on nearshore water circulation patterns, water quality, and, consequently, the quality of estuarine habitat for fish populations in the central Beaufort Sea. During the brief summer period when the Beaufort Sea is not frozen, anadromous fish are generally restricted to the immediate nearshore

animals will die before the next spring. A year in which increased overwintering mortality occurs for some percentage of a population will result in a direct and immediate decline in overall population size by the same percentage. A population could take several decades to recover in numbers even if no similar overwintering mortality events were to occur in subsequent years. Of course, if increased overwinter mortality were to recur during subsequent generations, recovery would not proceed. If such conditions occurred more than once in a single generation, the degree of the resulting population decline would be multiplied. Similar, but less immediate, impacts could also occur if conditions become severe enough to reduce growth without directly increasing overwinter mortality. One such event per generation could reduce fecundity or delay the age at which the fish reach maturity and spawn. Reduced fecundity and delayed maturity would also result in a direct decline in population size.

Monitoring programs have provided evidence that these impacts are already beginning to occur. The indicators include: 1) basic changes in the structure of the nearshore fish community to one dominated by marine and relatively salt-tolerant species, with freshwater species having all but disappeared in the area; 2) reduction in the strength of young age-classes of Sagavanirktok River broad whitefish since 1981; 3) smaller size-at-age for a large cohort of Arctic cisco in the Prudhoe Bay area in 1985, together with evidence that they may not have survived overwintering; and 4) evidence (including stomach sampling) that food organisms are not effectively unlimited.

The proposed Niakuk causeway would exacerbate the impacts and ecological risks posed by the existing causeways. By deflecting the coastal water mass and water from the west channel of the Sagavanirktok River, the Niakuk causeway would be expected to enhance the amount of marine water upwelled in the vicinity of Prudhoe Bay. The Niakuk causeway would further restrict river overflooding into Prudhoe Bay, affecting the formation of nearshore leads used by outmigrating fish in the early summer. It would also accelerate freeze-up processes within the single most important pathway used by fish migrating to and from the Sagavanirktok River overwintering sites and refuge areas.

Taken together, causeway-induced alterations in circulation patterns, water quality, and ice dynamics - occurring as they do directly within the critical nearshore estuarine zone - now make every year more similar to a naturally harsh year. The indicators show that the anadromous fish of the central Beaufort Sea are already being affected by these conditions. This means that long-term declines in their populations are likely. Should truly harsh years be in store, catastrophic impacts to these populations - and the fisheries they support - can quickly occur. Given the lack of reliable information on population sizes and the fact that monitoring programs have not been designed to measure population sizes directly, it is possible that significant declines have already begun to occur. Restoration of pre-causeway circulation patterns, particularly restoration of more continuous estuarine conditions in the nearshore zone, is necessary in order to reduce these impacts to fish habitat and water quality. In contrast, construction of additional causeways in the area would significantly increase these impacts and risks.

INTRODUCTION

Prudhoe Bay is located on the central Beaufort Sea coast approximately halfway between Point Barrow and the Alaska-Canada border (Figure 1). Considerable industrial activity has occurred in the general Prudhoe Bay area, as it is the hub of the largest producing oil field in the United States and the origination point for the 1,300 kilometer long Trans Alaska Pipeline System. This industrial activity has spread into nearby offshore waters as well, and three gravel causeways have been constructed in the area (Figure 2). Two of these - the West Dock causeway and the Endicott causeway - extend four kilometers or more from shore and have been the subject of considerable controversy both prior to and since their construction. The primary concerns addressed in this report are the impacts of the gravel structures to water quality and circulation patterns, and, consequently, to the quality of habitat for the anadromous fish populations of the region. (Other water quality issues, such as potential effects from waste discharges associated with industrial activities supported by the causeways, are not discussed here.)

The region's anadromous fish are an important resource for subsistence users in both Alaska and Canada. During the brief summer feeding period when the Beaufort Sea is not frozen, the fish are generally constrained to the immediate nearshore zone where inhospitable marine conditions are displaced by warmer, brackish waters. It is across this same critical nearshore zone that the causeways have been constructed, disrupting nearshore circulation patterns and causing the warm, brackish habitat to be replaced by offshore marine water across many miles of coastline. The impacts and risks posed by Prudhoe Bay area causeways are significant. The Alaska District, U.S. Army Corps of Engineers, has declared the impacts of the Endicott causeway unacceptable and is considering mitigation measures. This report has been prepared as a basis of support for decisions about mitigation at both the Endicott and West Dock causeways. The following pages summarize the current state of knowledge about the nearshore environment and the impacts of causeways in the central Beaufort Sea.

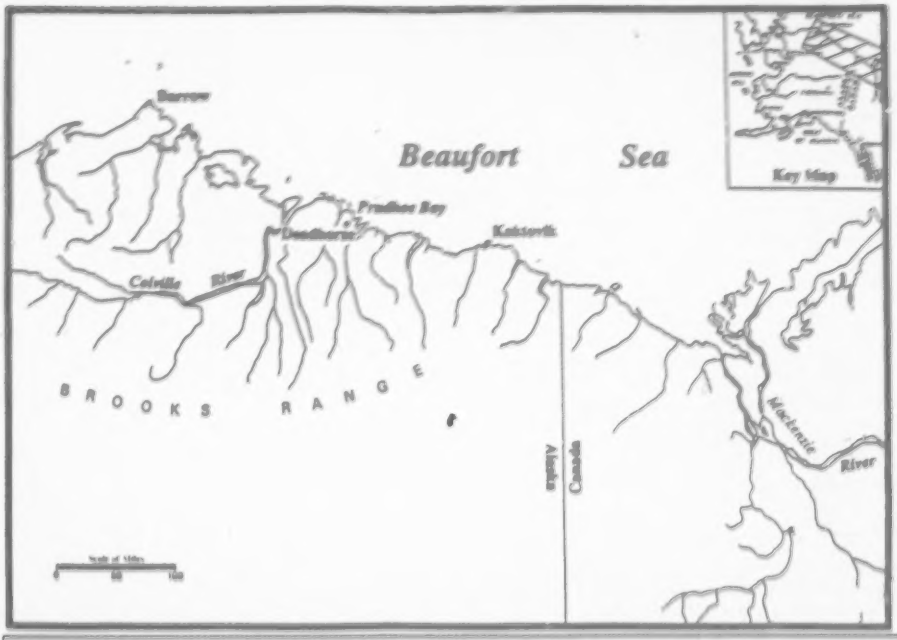

Figure 1
The Beaufort Sea coast. The Colville and Mackenzie are the major rivers discharging into the Beaufort Sea.

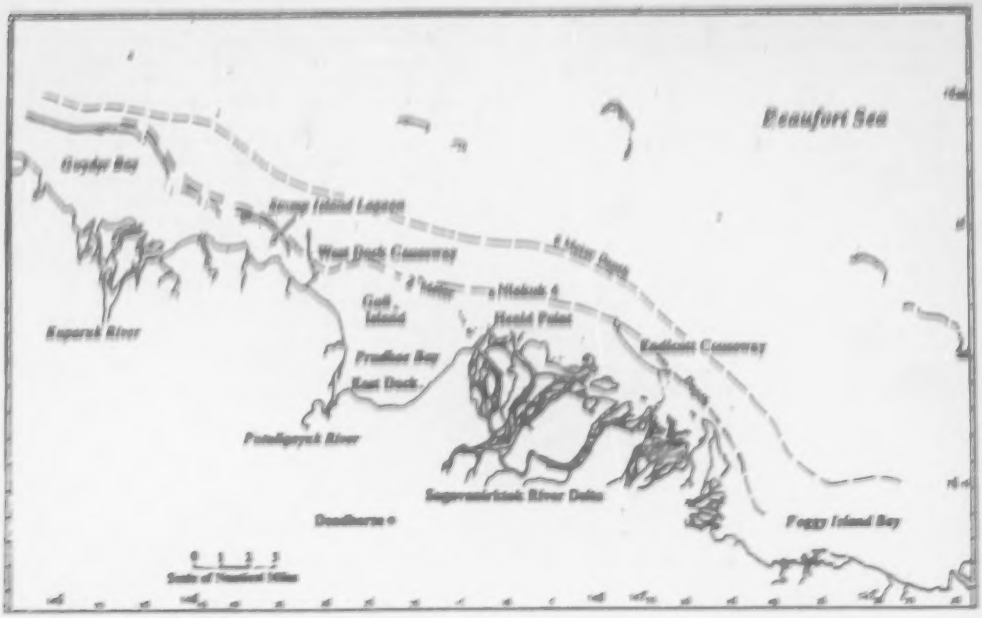

Figure 2
The Prudhoe Bay area, showing the locations of existing man-made gravel causeways.

ENVIRONMENTAL SETTING

The nearshore environment of the central Beaufort Sea is very different, both physically and biologically, from coastal zones elsewhere in the United States. A basic understanding of this special environment is necessary in order to place the impacts and risks posed by nearshore causeways into context. This section presents information about the physical processes and biological setting of the central Beaufort Sea coast in the absence of the causeways. Because pre-causeway baseline data are limited, this discussion is based largely on data gathered since construction of the West Dock causeway. Emphasis is placed on the nearshore Prudhoe Bay vicinity, defined here generally as extending from Foggy Island Bay through Gwydyr Bay and from shore to approximately the 6-meter depth (Figure 2).

PHYSICAL ENVIRONMENT

Much of the Prudhoe Bay area environment is extremely shallow: the 2-meter isobath occurs from 2 to 8 kilometers offshore in most locations (Figure 2). A shoal, where water is only approximately 1 meter deep, extends across the mouth of Prudhoe Bay from near the base of the West Dock causeway, past Gull Island, to the Heald Point area. During the winter, approximately 2 meters of ice forms along the Beaufort Sea coast. This results in most of the nearshore freezing completely to the bottom. This large area cannot serve as feeding and rearing habitat for fish until bottom-fast ice breaks up and open water is available. Ice cover here lasts about nine months, with open surface water found only during about 8 to 12 weeks in the summer.

During the summer open-water period, the direction of the current plays a large role in determining regional water quality. Due to the extreme shallowness of the nearshore area, water movements are dominated by the wind, with currents responding very rapidly to changes in wind direction or intensity. Winds from the easterly and westerly quadrants are by far the most common during the open-water season, with easterly winds generally prevailing. Therefore, water movement within the broad, shallow

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nearshore zone is primarily along-shore throughout the summer and generally follows bottom contours.

The two largest rivers that discharge into the Beaufort Sea are the Mackenzie, approximately 160 kilometers east of the Alaska-Canada border, and the Colville, about 70 kilometers west of Prudhoe Bay (Figure 1). These two rivers provide by far the greatest input of fresh water to the Beaufort Sea. During the summer this water, along with discharges from the Sagavanirktok (Figure 2) and several smaller rivers, mixes with cold offshore marine water to form a nearshore brackish band called the "coastal water mass" (the "coastal plume" of other authors). This band of brackish water flows east or west along the Beaufort Sea shoreline depending on the direction of the prevailing winds, as described above.

Satellite images (Stringer, 1985; Envirosphere, 1987; Envirosphere, 1988c; NOAA, 1988) and early hydrographic study (Barnes et al., 1977) provide supporting evidence that prior to construction of any causeways, the brackish coastal water mass was a generally continuous nearshore feature across the Prudhoe Bay area under both easterly (Figure 3) and westerly winds (Figure 4). Discharge from the Sagavanirktok River helped to maintain the estuarine nature of the coastal water mass as it flowed westward (under easterly winds) past Prudhoe Bay and through the Gwydyr Bay/Simpson Lagoon system. The large Colville River discharge did the same for these areas under westerly winds. Although different physical processes influenced the coastal plume under easterly versus westerly winds (as described below), the plume's integrity as a continuous mass of warm, brackish water was generally aintained.

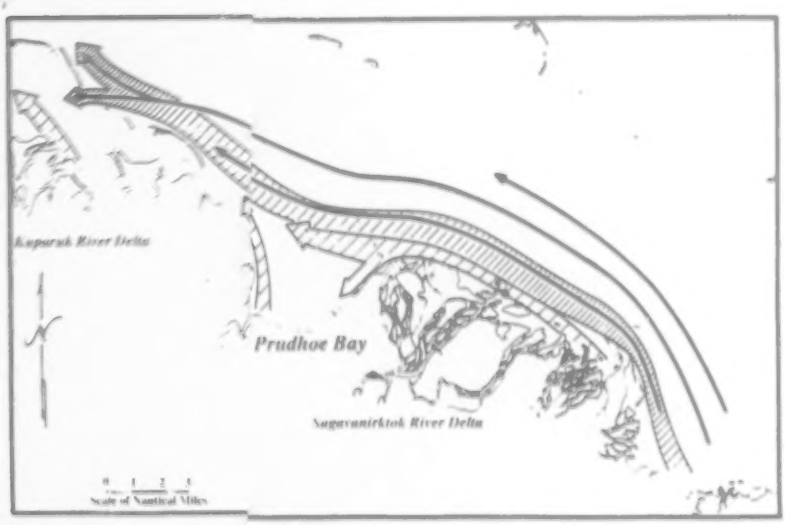

Figure 3
Generalized flow of nearshore waters during sustained easterly winds, in the absence of the West Dock and Endicott causeways. Heavy solid arrows denote flow of subsurface marine water. Cross-hatched arrows denote surface flow of river and coastal water, with the density of cross-hatching proportional to salinity. Adapted from Envirosphere, 1988b and NOAA, 1988.

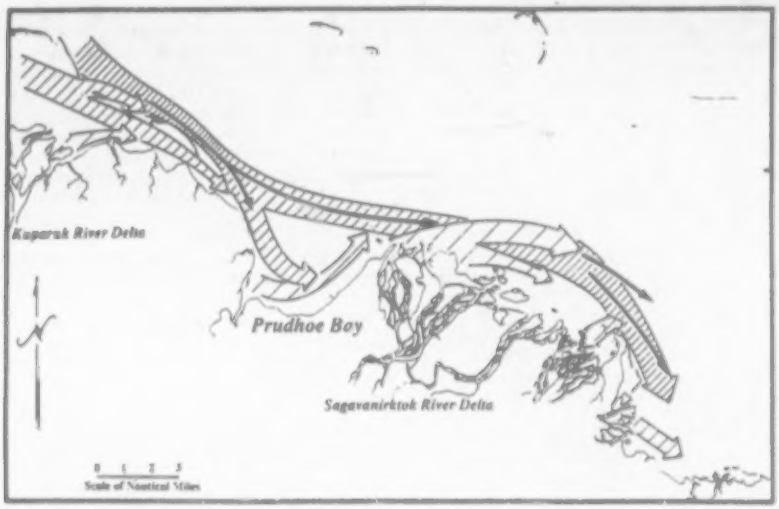

Figure 4
Generalized flow of nearshore waters during sustained westerly winds, in the absence of the West Dock and Endicott causeways. Heavy solid arrows denote flow of subsurface marine water. Cross-hatched arrows denote surface flow of river and coastal water, with the density of cross-hatching proportional to salinity. Adapted from Envirosphere, 1988b and NOAA, 1988.

East Wind, Upwelling During easterly winds, nearshore water levels are lowered due to an offshore trend in the surface current (Britch et al., 1983; NOAA, 1988). In a process called upwelling, sea level is stabilized as the surface current is replaced with deeper strata not affected by the wind. In the absence of causeways, upwelling could bring marine bottom water into nearshore locations as shallow as 2-4 meters in the Prudhoe Bay area (NOAA, 1988; Envirosphere, 1988d). A typical upwelling event during strong easterly winds, measured away from any causeway influence, is depicted in Figure 5. Two aspects of the phenomenon shown in the figure are important. First, the high salinity water that upwells to within the 3-meter depth remains overlain with brackish coastal water - it does not reach the surface. Second, because the area is extremely shallow for several kilometers offshore, the upwelled marine water does not invade very far into the nearshore zone. Hence, under normal circumstances, upwelling would not disrupt the continuity of the coastal water mass or its dominance across the broad, shallow Prudhoe Bay area.

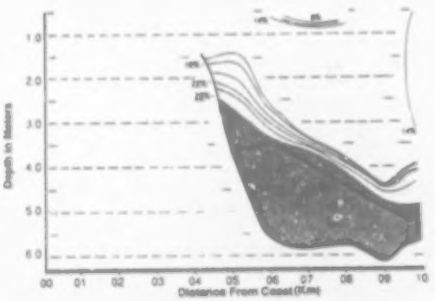

Figure 5
Upwelling along the Sagavanirktok River delta during easterly winds. In this 1982 example measured at the present location of the Endicott causeway, natural upwelling of high salinity bottom water (shaded) can be seen extending to approximately the 2.5 meter depth. Adapted from Envirosphere, 1987b.

West Wind, Intrusions During westerly winds, the surface current has a small onshore component

that raises water levels. Initially, when the water level begins to rise, the entire water mass moves shoreward, generally preserving the cross-sectional characteristics that were in existence at the time the event began (Britch et al., 1983; Envirosphere, 1988d). In other words, if the water column is stratified to begin with, all of the strata will move shoreward. This is called an intrusion. For example, intrusion events can bring marine bottom water over the Gull Island shoal (Figure 2) and into Prudhoe Bay if marine water resides shallow enough on the seaward slope of the shoal before the intrusion begins. However, prior to causeway construction, the water that would move onshore during an intrusion event would be the same brackish coastal plume water generally dominant throughout the nearshore for much of the open-water period. Intrusions, in that case, would not result in any serious disruption of the continuity of nearshore brackish conditions.

Overall, nearshore Prudhoe Bay area water levels can vary by as much as 1 meter between strong easterly and westerly winds. Since so much of the area is less than two meters deep, it is not surprising that changes in wind-driven current and water levels significantly influence the nearshore zone. The change in water level comes about fairly rapidly upon shifts in wind direction (or upon a relaxation in the strength of sustained winds). Water levels generally stabilize within a day or so after easterly or westerly winds have established themeselves.

During sustained westerly winds "downwelling" also occurs. Marine water that may have upwelled into nearshore areas as shallow as 2-4 meters during east winds is forced further offshore. However, this phenomenon generally takes place farther offshore (outside the 2 or 3 meter depth contour) and after water levels have equilibrated.

Ice Dynamics Ice cover persists for approximately nine months along the Beaufort Sea coast (NOAA, 1988). During the winter, the nearshore Beaufort Sea freezes to the bottom to depths of about 2 meters; this is the same general area occupied by the coastal water mass during the summer. The timing and dynamics of breakup and freeze-up can influence the overall productivity of the nearshore environment during the brief summer season. A harsh year - one in which breakup is late and freezeup early - could significantly limit overall biological productivity. Conversely, an unusually long open-water period during the summer would allow for much higher productivity.

In the Arctic, rivers thaw and flow prior to the breakup of sea ice. Fresh river water thus initially flows over the top of the sea ice in the nearshore zone. The presence of this over-ice flow of fresh, warmer water speeds the breakup of nearshore sea ice by flowing into and opening up cracks and holes. The nearshore area thus usually has the first open water, and leads in the sea ice form there first. These leads are corridors for early dispersal of anadromous fish from overwintering sites to feeding and rearing areas. Prior to construction of the West Dock and Endicott causeways, overflooding from the Sagavanirktok, Putuligayuk, and Kuparuk rivers was unrestricted. Warm breakup flows covered the entire Prudhoe Bay area coastline (Figure 6).

Figure 6
Estimated pre-causeway distribution of flood waters from the Kuparuk and Sagavanirktok rivers, based on LANDSAT image from May 30, 1985. Adapted from NOAA, 1988.

BIOLOGICAL ENVIRONMENT

During the summer in the central Beaufort Sea, estuarine conditions dominated the broad, shallow areas around Prudhoe Bay and the lagoon system to the west in the absence of causeways (see Physical Environment, above). These conditions created a large expanse over which primary productivity, and in turn the productivity of invertebrates (predominantly mobile crustaceans - principal prey for the anadromous fish), were presumably high (Envirosphere, 1988b). This nearshore estuarine habitat supported a fish food resource much greater than exists in North Slope rivers and streams. In this environment, fish could feed fairly rapidly, with high assimilation and growth rates and a minimum of metabolic costs. This allowed net energy gain to be

maximized over the very short summer - critical for overwintering survival, year-to-year growth, and eventual reproduction (Smith, 1982).

Odum (1971) notes it to be "self-evident that different (estuarine) circulation patterns and gradients will greatly influence the distribution of individual species" and describes natural arctic ecosystems as a special class of physically stressed estuarine ecosystems. This section describes the biological setting of the Prudhoe Bay area and what is known of ecological relationships in this special estuarine environment.

Anadromous Fish Anadromous fish are those that spawn in fresh water and migrate to rear in marine or estuarine areas. Migration is undertaken for the purposes of feeding, because food is generally more available in marine and estuarine areas than in fresh water (Congleton et al., 1981 in Macdonald et al., 1988; Gross et al., 1988). However, the energetic expenditures associated with this migration in the extreme conditions of the Arctic make the advantages of this life history pattern marginal for most species (Wohlschag, 1957). In contrast to anadromous fish elsewhere that utilize estuaries for a relatively short but critical period before moving into the marine environment, Arctic marine waters are inhospitable for anadromous fish (Macdonald et al., 1988). Therefore, anadromous species in the Beaufort Sea depend heavily on estuarine habitat for feeding and rearing, because this habitat represents the most productive, least severe of the environmental conditions available to them.

The dominant anadromous fish species in the Beaufort Sea include Arctic cisco (Coregonus autumnalis), least cisco (Coregonus sardinella), broad whitefish (Coregonus nasus), and Arctic char (Salvelinus alpinus) (Figure 7). These fish must obtain the vast majority of their entire year's energy intake (90 percent or more) during the very limited period of open water. The feeding and rearing period, as well as the availability of suitable habitat conditions during this period, is so limited (approximately 10 weeks) that these populations naturally grow and mature more slowly than related populations and species from more temperate areas (Craig and Haldorson, 1981; Dutil, 1986). In addition, the ability to acquire energy rapidly is so limited that these fish are unable to spawn in consecutive years (Dutil, 1986; NMFS, 1987).

A variety of other fish species are also found in this area at times. In particular, Arctic cod (Boreogadus saida) and fourhorn sculpin (Myoxocephalus quadricornis) are routinely caught by post-causeway environmental monitoring programs. Arctic cod, a marine species, is often extremely abundant in association with the higher salinity water.

The Arctic anadromous fish are an important subsistence resource for native villages on the Beaufort Sea coast (Jacobson and Wentworth, 1982) and throughout the Mackenzie River drainage in Canada (NMFS, 1987). The only commercial fishing operation in the Alaskan Beaufort Sea is located in the Colville River delta. This operation targets on these same anadromous fish. Fish, and fishing, also play important roles in the culture of the peoples native to the North Slope (Jacobson and Wentworth, 1982). The importance of anadromous fish increases when other subsistence resources, such as caribou, are less available.

Fish Distribution in the Prudhoe Bay Area Prior to construction of the West Dock causeway, least cisco migrated into the Prudhoe Bay vicinity from the Colville River and were the most numerous anadromous fish species in Prudhoe Bay sampling (Furniss, 1974; Doxey, 1977). Least cisco were more abundant in the nearshore zone than Arctic cod and fourhorn sculpin (marine species) and much more abundant in the Prudhoe Bay vicinity than the anadromous Arctic cisco. Arctic cisco numbers were higher in the Colville River area, and these fish apparently by-passed Prudhoe Bay to a large extent during their migrations between the Colville and Mackenzie rivers. Broad whitefish, anadromous but less tolerant of marine conditions than either least or Arctic cisco, were nonetheless regularly present in river plumes within the nearshore zone in the Prudhoe Bay area. Freshwater species (including humpback whitefish and round whitefish) also appear to have been fairly regular members of this nearshore fish community prior to the final extension of the West Dock causeway.

Overall, the nearshore biological community of the Prudhoe Bay area was characterized by the presence of freshwater species and species relatively intolerant of high salinity, low temperature (marine) conditions; marine species and Arctic cisco were only minor components of the community.

The dominant anadromous fish species share some similar habitat requirements and distribution, but have important differences as well. Similarities include distribution in the estuarine water of the shallow nearshore zone, with feeding principally on near-bottom (epibenthic) invertebrates including mysids, amphipods, and copepods. In addition, they all must return to suitable, non-marine habitat to overwinter.

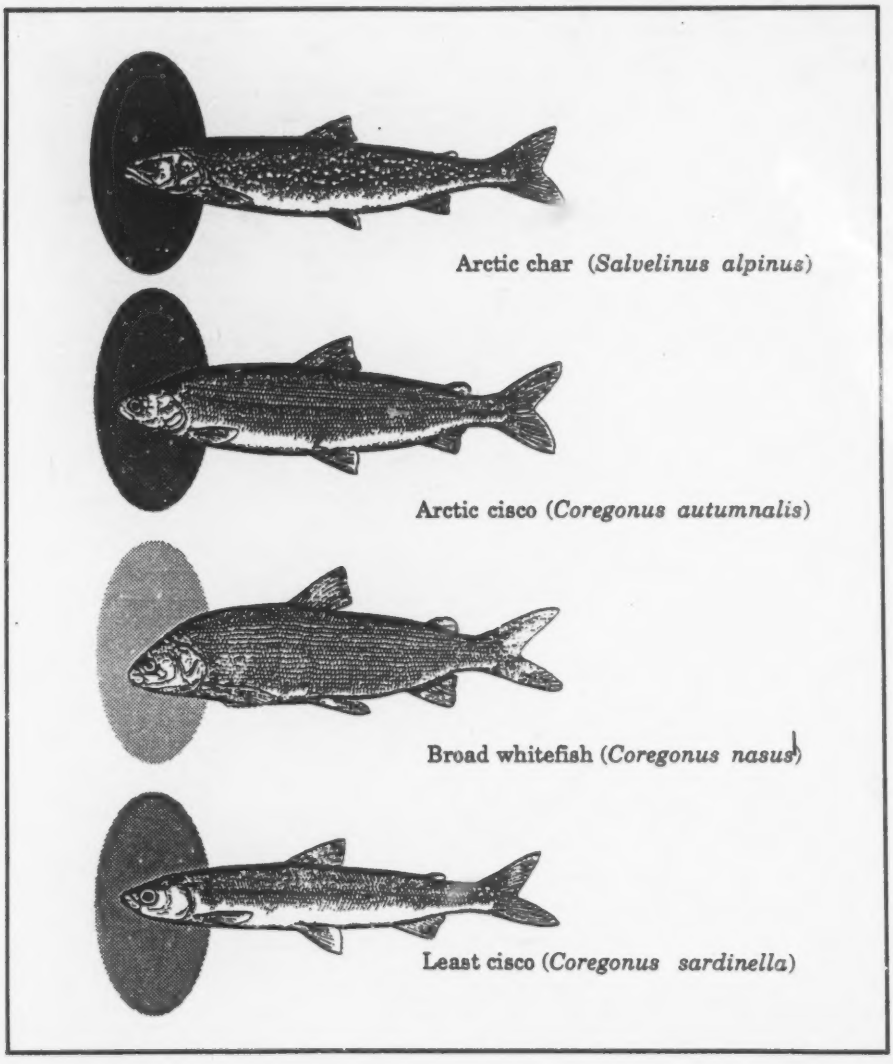
Arctic char (*Salvelinus alpinus*)
Arctic cisco (*Coregonus autumnalis*)
Broad whitefish (*Coregonus nasus*)
Least cisco (*Coregonus sardinella*)

Figure 7
Anadromous fish species of primary concern in the central Beaufort Sea. Fish are shown in decreasing order according to their relative importance. Shading indicates the relative tolerance of the fish to high salinity and cold temperatures with tolerance increasing with the darkness of the shading. Fish figures adapted from McPhail and Lindsey, 1970. Figure courtesy of C. Johnson, National Marine Fisheries Service, Anchorage, Alaska.

Differences exist among the anadromous species in terms of how they use specific salinity and temperature ranges within the overall estuarine zone. The fish may tolerate a broader range of conditions than they normally use for feeding, but they must optimize multiple environmental variables in order to maximize their energy gains. Broad whitefish utilize fresher-water areas, and have a relatively localized distribution directly associated with river deltas. For this reason, they feed more exclusively on terrestrial- and riverine-derived food sources such as insect larvae. Arctic char often feed in and can tolerate higher salinities (Roberts, 1971), but may move into freshwater (if whitefish are not present) for digestion (Johnson, 1981). Because of this and physical differences that allow Arctic char to feed more efficiently on other fish (Svardson, 1976), they use different areas and have somewhat different feeding habits.

Least cisco and Arctic cisco are intermediate in their use of the nearshore habitat. Each of these species can generally tolerate somewhat higher salinities than broad whitefish, but they do not range as far from the immediate nearshore areas for feeding and rearing as Arctic char. Figure 8 shows a representation of fish use within the nearshore environment.

Another difference among species is their distribution and dispersal from spawning and overwintering areas. Least cisco in the Prudhoe Bay area are near the eastern end of their summer distribution; they spawn and overwinter in the Colville River. This is in contrast to Arctic cisco, that migrate as juveniles from spawning grounds in the Mackenzie River to rear near the Colville River. [1/] Arctic cisco also overwinter primarily in the Colville. Arctic char are represented by discrete spawning populations from several river systems along the North Slope, although summer feeding distributions intermingle.

Other differences in use of the nearshore environment occur within species (for instance, by size or age). For example, tolerance to higher salinities and lower temperatures tends to increase with age, especially for least and Arctic cisco. Because of such differences, all shallow brackish areas within the coastal zone cannot be assumed to uniformly serve as "habitat" for all species or size-classes of anadromous fish at all times.

Habitat Requirements of Beaufort Sea Anadromous Fish Temperature and salinity are very important habitat parameters for Beaufort Sea anadromous fish (Craig and Haldorson, 1981;

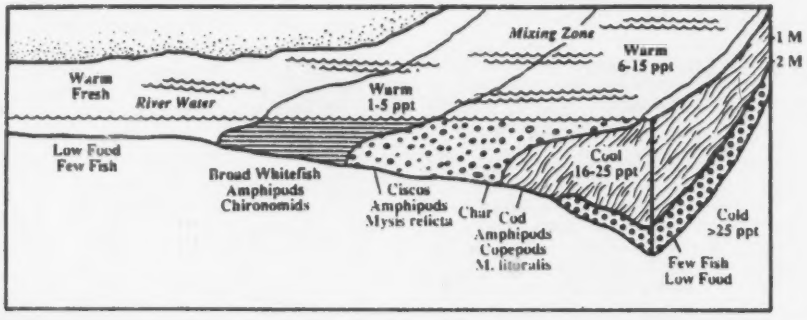

Figure 8
General use of nearshore estuarine habitat by fish in the central Beaufort Sea. Adapted from Envirosphere, 1987.

1/ It is often assumed that the Alaskan population of Arctic cisco merely represents a passively distributing portion of the overall Mackenzie River population, with the numbers in Alaskan waters being proportional to the percentage of Mackenzie River water that is blown to the west in a given year (Fechhelm and Fissel, 1988). Other data suggest this may not be the case (Envirosphere, 1988b; Envirosphere, 1988d). It is clear from the perspectives of management and risk that the Alaskan Beaufort Sea Arctic cisco must be considered a discrete stock that undergoes an active, directed migration (although almost certainly wind-aided). If this is true, effects to these fish would not be quickly reversible if the causeways were removed. These Arctic cisco may represent a genetically discrete stock originating in particular drainages of the Mackenzie, which would imply a potential for long-term causeway effects to result in detrimental impacts to the gene pool, to community structure, and to subsistence and commercial harvests in Canada as well as Alaska.

Envirosphere, 1987; Envirosphere, 1988b; Envirosphere, 1988d) and much is known about their effects. Temperature and salinity conditions have direct metabolic consequences; however, each affects fish in different ways. Basically, temperature affects the rate of energy utilization while salinity affects its distribution within the fish. For example, warm temperatures allow faster assimilation of food, leading to a greater amount of feeding and greater growth over time. Very cold temperatures make these cold-blooded organisms lethargic to the point that feeding and growth rates slow dramatically, independent of food availability (Brett, 1964; Brett, 1971; Brett, 1976). In contrast, very high or very low salinities require that a large percentage of the fish's energy be expended to regulate blood chemistry (Smith, 1982). The normal marine condition in the Arctic is extreme - a combination of both very cold temperatures and high salinity - and thus it generally represents the least suitable habitat conditions for anadromous fish.

Temperature in the Beaufort Sea is of particular importance to anadromous fish. The period during which relatively warm water dominates the nearshore zone is even more limited than the period of open water. As the summer progresses, river discharges decline and solar warming decreases (NOAA, 1988). Consequently, the quality of feeding habitat for anadromous fish often diminishes as the season progresses. Although prey abundance remains high late in the season (Envirosphere, 1987), cold marine conditions reduce the energetic value of utilizing this prey. Mild years - for example, when winds tend to hold warm, fresh river water in the nearshore zone longer than during harsher than average years - can naturally result in higher productivity and greater fish growth overall. Conversely, harsh years reduce growth potential because lowered temperatures slow assimilation rates. (As described earlier, westerly winds tend to hold fresh river water onshore, promoting more efficient mixing with the coastal water mass. These conditions result in both higher average temperatures and lower salinities in the nearshore zone.)

Although fish are affected by overall conditions, at any given moment fish respond primarily to local and immediate habitat quality. It is counter productive for fish to remain in an energetically negative environment. This is true at any time - not just late in the season when the entire region becomes more marine. Harsh years as described above limit the overall amount and quality of suitable feeding habitat available across the region, but fish must still attempt to utilize the most suitable habitat remaining available. At some point the fish simply retreat from unsuitable conditions (for example, when marine water quickly invades the nearshore habitat). Observations that cold marine water directly inhibits the movement of anadromous fish in the area have been made during the mid-summer rearing period as well as late in the season (Envirosphere, 1988b; Envirosphere, 1988d). It is clear that site-specific conditions at a given time, as opposed to average regional or seasonal conditions, are of most immediate importance to the fish.

Parameters other than temperature and salinity surely have a role in determining habitat quality for central Beaufort Sea anadromous fish , but little is known about them. For example, little is known about how to specifically define individual niches, or what constitutes optimal feeding habitat for the different anadromous fish species. Such parameters as distance from spawning or overwintering areas, water depth, wave height, turbidity, wind direction or strength, predator-prey interactions, and competition all probably have some importance. Other important ecological issues under speculation are how "optimal" habitat for different sizes or species of fish may be affected by interaction of the parameters listed above and whether any of the fish adopt behavioral strategies to maximize growth and survival within a given set of conditions. Overall, specific definition of niches for individual species is lacking and without such information the ability to make precise predictions about the effects of nearshore industrial developments on each species will continue to be limited. Future study may provide useful information. However, existing information is sufficient for identifying the more obvious impacts and risks of Beaufort Sea causeways.

CAUSEWAY PROJECTS

Two major causeways have been constructed in the Prudhoe Bay area; each is a massive solid fill gravel structure. The impacts of these causeways on water quality and fish habitat have become a major environmental concern. Studies to document the impacts of the causeways have been required by the permits authorizing causeway construction. This section briefly describes the causeways and the monitoring programs that have been undertaken to determine their impacts.

The West Dock Causeway This was the first major causeway to be built in the Prudhoe Bay area. The 13,000-foot (4,000+ meter) long causeway is located at the northwestern corner of Prudhoe Bay, on the eastern end of the Gwydyr Bay/Stump Island lagoon complex (see Figure 2). Construction occurred in three phases. The

original structure was built in 1975 as access to a dockhead some 4,000 feet offshore. The second 4,000+ foot leg was completed the following year under an emergency permit from the U.S. Army Corps of Engineers because supply barges had become frozen into the sea ice. An additional dockhead that continues to support shipping activities was built onto the end of the second leg. The final 4,000-foot section of the causeway was built in 1980 to provide access to a seawater intake and treatment plant for waterflood of the Prudhoe Bay oilfield (COE, 1980). (The West Dock causeway is sometimes referred to as the "Waterflood" causeway for this reason.) A 50-foot (15-meter) bridged opening ("breach") was constructed at the shoreward end of the final leg of the causeway in an attempt to provide for fish movement between Prudhoe Bay and the Gwydyr Bay/Stump Island Lagoon system. Overall, the construction of the West Dock causeway required over 1,500,000 cubic yards of gravel. The West Dock causeway is operated by ARCO Alaska, Inc., on behalf of the Prudhoe Bay Unit owner companies.

The Endicott Causeway The Endicott causeway was constructed in 1985 to provide access to two man-made gravel oil production islands. This causeway extends over 22,000 feet (7,000 meters) into the Beaufort Sea from the middle of the Sagavanirktok River delta just east of Prudhoe Bay (see Figure 2). The Endicott causeway is actually made up of two causeways: a 15,000+ foot (4,700-meter) inter-island causeway, and a 10,000+ foot (3,150-meter) causeway to shore. Two breaches, with a combined length of 700 feet (220 meters), were built into this shoreward causeway in an attempt to ameliorate impacts to water quality and fish habitat predicted in the Environmental Impact Statement (EIS) for the project (COE, 1984). Over 2,700,000 cubic yards of gravel were used to construct this causeway. The Endicott causeway is operated by Standard Alaska Production Company for the "Duck Island Unit" owner companies.

Other Causeways In addition to the West Dock and Endicott causeways, a small 1,100-foot (350-meter) solid-fill gravel causeway known as East Dock has been built on the eastern shore of Prudhoe Bay (Figure 2, Figure 9). East Dock was built in the early 1970s for shipping related to oil exploration activities in the Prudhoe Bay area.

Other major causeways have been proposed in the Prudhoe Bay area as well (Figure 9). The Lisburne causeway, proposed by ARCO Alaska, Inc. in 1984, would have extended over 13,000 feet (4,200 meters) into the middle of Prudhoe Bay from the western shore. It would have provided access to an offshore drilling island for production from a portion of the Lisburne oilfield. (Five related drilling pads are all onshore and have been permitted and constructed separately). This

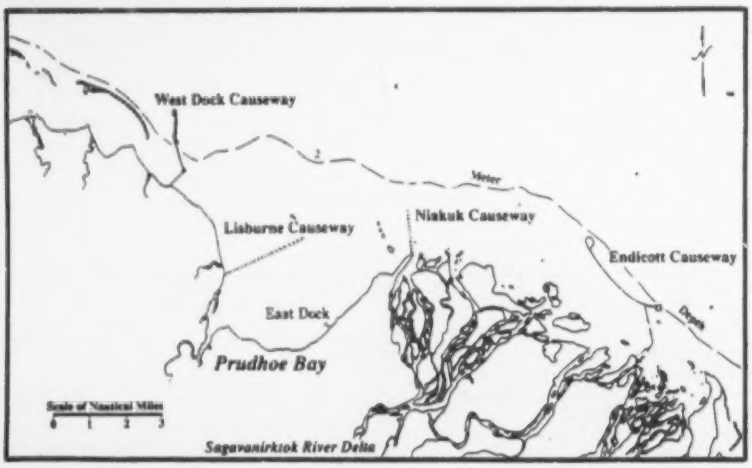

Figure 9
Location of proposed causeways in relation to existing causeways in the Prudhoe Bay area. The Niakuk causeway was proposed in1988; the Lisburne causeway proposal has been withdrawn. Modified from SAPC, 1988.

proposal was withdrawn by the developers in 1987 in favor of directional drilling from the existing onshore sites.

Another causeway was proposed by Standard Alaska Production Company in 1987. If constructed, the Niakuk causeway would be nearly 7,000 feet (2,200 meters) long, extending north from Heald Point (at the northeast corner of Prudhoe Bay) to a man-made oil production island. Additional solid-fill gravel causeways have been contemplated by industry and may be proposed for the Prudhoe Bay area in the future. EISs for federal oil and gas lease sales have also discussed causeways relating to nearer-shore outer continental shelf development (DOI, 1982; DOI, 1984). In addition, the final legislative EIS for management of the coastal plain of the Arctic National Wildlife Refuge (ANWR), approximately 160 kilometers to the east of Prudhoe Bay, assumes that causeways may be needed to support port development there (DOI, 1987).

Causeway Monitoring Programs In 1972, Barnes et al. (1977) conducted nearshore oceanographic surveys across the central Beaufort Sea coast; however, other environmental data predating construction of the first portion of the West Dock causeway are extremely limited. Just prior to and following construction of its second leg in 1976, the West Dock causeway was the subject of several studies required by the Corps of Engineers (Furniss, 1975; Bendock et al., 1979; WCC, 1979; Moulton et al., 1980). In addition, after the Waterflood extension was built in 1980, fisheries and oceanographic monitoring continued for four years (WCC, 1982; Envirosphere, 1983; Envirosphere, 1984; Envirosphere, 1986). The draft synthesis report for these four years of monitoring was completed in 1988 (Envirosphere, 1988b).

The lack of pre-causeway baseline data is a serious limitation to the West Dock causeway monitoring programs. Also, environmental studies conducted after that causeway's construction were poorly coordinated. Monitoring objectives and methods differed substantially among the different investigators, such that comprehensive, comparable data were not collected from year to year. Each study differed as knowledge about how to measure the effects of the causeways evolved. As a result, only the final year's monitoring at the West Dock causeway was reasonably comprehensive and relatively comparable to the approach later used at the Endicott causeway.

In contrast to West Dock causeway monitoring, the Endicott causeway monitoring program was intended to emphasize coordinated planning and the collection of an internally consistent multi-year data set. This monitoring program also suffered from limited baseline data collection, this time specific to the Sagavanirktok River delta region. However, a complete monitoring program was fielded during the first three years following construction of the causeway in early 1985 (Envirosphere, 1987; Envirosphere, 1988a; Envirosphere, 1988d; NOAA, 1988). The Corps of Engineers decided to discontinue the major fisheries and supporting oceanographic portions of the Endicott causeway monitoring program after results from the three years of study showed that impacts substantially exceeded many of the predictions made in the Endicott project EIS. Other aspects of the monitoring program are expected to continue, including a terrestrial program and oceanographic monitoring not directly related to the fisheries program.

As directed by the Corps of Engineers, the Endicott causeway monitoring program was habitat-based rather than population-based. Habitat monitoring is more effective and considerably less expensive than direct population monitoring in the Arctic. Habitat monitoring has its basis in accepted ecological principles. In particular, it is recognized that populations in low diversity physically stressed environments, or those in environments that are subject to irregular environmental perturbations, tend to be regulated by physical components of the environment such as weather, currents, temperature, etc. (Odum, 1971). Anadromous fish populations in the central Beaufort Sea exist in an environment that fits both the above descriptions well. Therefore, attention for monitoring focused on habitat changes and other indicators of potential population-level impacts, as opposed to direct measurement of population sizes through time. This approach was intended to allow indicators of environmental risk to be assessed before irreversible adverse impacts were realized, rather than after such impacts had already occurred.

IMPACTS OF CAUSEWAYS

The primary concerns about the West Dock and Endicott causeways are their impacts to the water quality and circulation patterns of the central Beaufort Sea nearshore estuarine environment. During their brief summer feeding period, anadromous fish are generally constrained to this immediate nearshore zone where inhospitable marine conditions occurred less frequently in the past. It is within this same critical nearshore zone that causeways have disrupted circulation patterns and caused estuarine habitat to be replaced by offshore marine water across many miles of coastline. The following sections discuss the fundamental impacts of these massive

structures to the physical and biological environments. (Other potential impacts - e.g., related to industrial discharges or spills - are not addressed in this report.)

PHYSICAL IMPACTS

The basic physical impacts of constructing the causeways within the estuarine nearshore zone appear, with hindsight, to be easily predictable. Unfortunately, little site-specific baseline knowledge of nearshore processes in the central Beaufort Sea was collected before construction of either of the causeways had begun. The evolution in knowledge during several years of monitoring, however, has provided a clearer picture of the processes affected by the causeways.

Overall, causeways have disrupted the nearshore environment throughout the Prudhoe Bay area because of their construction perpendicular to the wind and nearshore current patterns. As will be explained, this disruption occurs under both easterly and westerly winds by: 1) deflecting both the coastal water mass and river plumes offshore, concurrently degrading their estuarine character through the loss of thermal energy and freshwater to offshore areas; 2) causing enhanced upwelling and intrusion of marine water directly into the nearshore environment, thus severing the band of estuarine conditions along the coast; and 3) both delaying breakup and accelerating freezeup in the nearshore zone.

The coastal water mass and the river plumes are deflected offshore by both the West Dock and Endicott causeways despite the breaching incorporated into each of them. Offshore deflection causes enhanced mixing with marine water and degradation of estuarine conditions. Under easterly winds, marine water upwells to replace the deflected water, and marine conditions often extend and dominate for many kilometers downstream. Today, the coastal water mass and Sagavanirktok River plume no longer are maintained in a generally continuous brackish band across the Prudhoe Bay area. Instead, nearshore water quality is more heterogenous, and marine conditions have become much more dominant. Overall, fundamental alterations in nearshore water quality and circulation patterns have occurred along as much as 65 kilometers of the Prudhoe Bay area coastline.

Offshore Deflection of Estuarine Water Masses

During easterly winds, the coastal water mass moves west along the coast until it encounters the

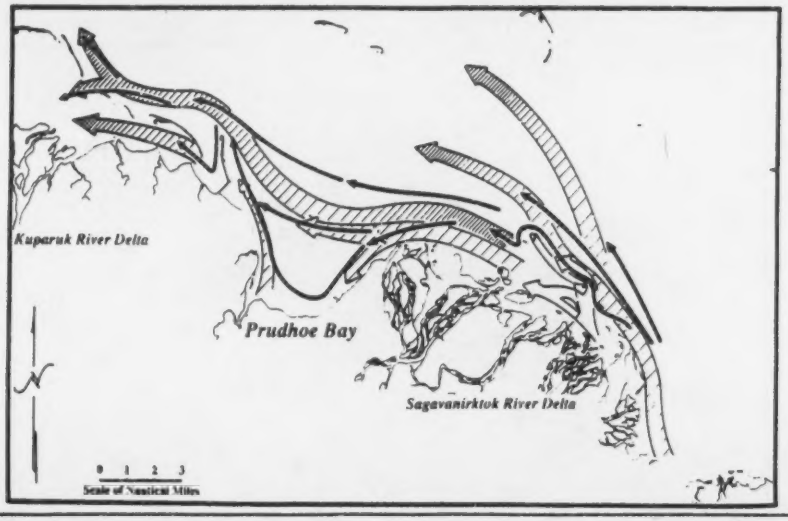

Figure 10
Generalized flow of nearshore waters during sustained easterly winds since construction of the West Dock and Endicott causeways, showing causeway-induced deflection of nearshore water masses. Heavy solid arrows denote flow of subsurface marine water. Cross-hatched arrows denote surface flow, with the density of cross-hatching proportional to salinity. Adapted from Envirosphere, 1988b and NOAA, 1988.

Endicott causeway. The nearshore 500 feet of breaching in the causeway generally does not accomodate all of the flow from the east channel of the Sagavanirktok River, and a portion of this flow is deflected to the 200-foot breach farther offshore (Envirosphere, 1988c; Envirosphere, 1988d). The second breach is not always sufficient either, so at times some of the river discharge is deflected further - around the end of the causeway. Because the existing causeway breaches are dominated by fresh Sagavanirktok River plume water, almost the entire coastal water mass is deflected offshore and around the structure (Figure 10). Depending on the precise direction of the wind, the deflected water will be held offshore (southeasterly winds), or will flow across the mouth of Prudhoe Bay, primarily just outside the Gull Island shoal (northeasterly winds). In general, a greater offshore deflection causes greater contact with offshore marine water and more rapid degradation of water quality. Increasing salinities averaging over 2 parts per thousand per kilometer (ppt/km) have been measured in the deflected water downwind from the Endicott causeway (Envirosphere, 1988a).

In the vicinity of West Dock, the deflected coastal water and the Sagavanirktok River plume often merge, but do not pass directly into the lagoon system as they did prior to construction of the causeway. The 50-foot breach in the West Dock causeway has been blocked almost continuously since its construction by gravel eroded from the causeway's sides. This breach allows virtually no water to pass. Therefore, upon encountering the causeway, coastal and Sagavanirktok River water is deflected offshore (Figure 10) outside of Stump Island Lagoon and Gwydyr Bay. Depending on the precise direction of the wind (southeasterly or northeasterly), all of the deflected water will be held offshore, or a portion may re-enter the lagoon system several kilometers to the west through various entrances between the barrier islands. After passing West Dock, the deflected water is again placed into greater contact with marine water and rapidly loses its estuarine character. Salinity of the water deflected by the West Dock causeway has been observed to increase at rates up to an additional 9 ppt/km (NOAA, 1988). Deflection of nearshore water masses also occurs during westerly winds. However, the overall physical impacts of the causeways differ during east and west winds. Upwelling during easterly winds and intrusions during the onset of westerly winds, as described below, cause much of this difference.

East Winds: Upwelling As water is deflected offshore at each causeway during easterly winds, the surface water in the lee of the structures is also blown to the west. Under pre-causeway

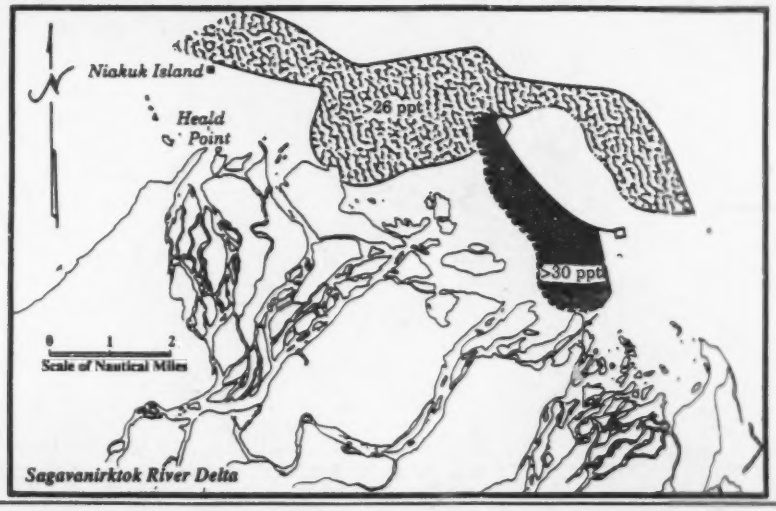

Figure 11
Salinity at 1 meter depth during sustained east winds, July 22, 1986 survey. Note that upwelled high salinity water (stippled) has been drawn into very shallow water between the Endicott causeway and Heald Point, and that even higher salinity water (shaded) has upwelled all the way in to the island-to-shore leg of the causeway, despite existing breaches. Adapted from Envirosphere, 1988d.

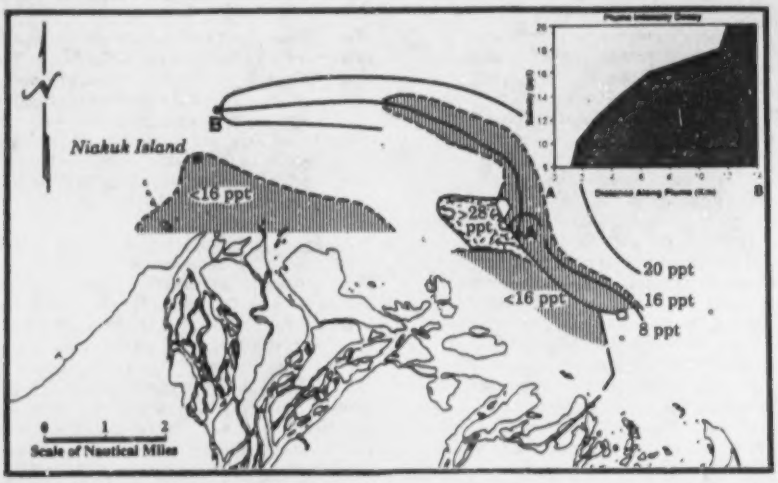

Figure 12
Detail of deflection and degradation of nearshore estuarine water at the Endicott causeway during sustained easterly winds. The A-B transect follows the center-line of the deflected water. Inset shows increasing salinity of the deflected water along the A-B transect. Adapted from Envirosphere, 1988b.

conditions, this water would be replaced by the adjacent coastal and river water; however, the causeways block this process. Subsurface marine water is drawn instead from offshore and upwells to replace the deflected water - even in very shallow areas. While natural upwelling in the region often brings marine water to the bottom in areas that are as shallow as 2-4 meters, the causeways result in upwelling to the surface in downwind areas with depths of less than 1 meter (Envirosphere, 1988d; NOAA, 1988). Given the expanse of very shallow water in the vicinity, significant additional areas now frequently experience marine conditions due to this enhanced upwelling.

The pattern of upwelling at the Endicott causeway is influenced by the structure's location between the two main channels of the Sagavanirktok River. Replacement water is partially made up of fresh discharge from the river. Some of this is fresh water that has been deflected offshore somewhat, flowing through the breaches in the causeway. The fresh water flows across the delta, past Heald Point and the Niakuk Islands at the northeast corner of Prudhoe Bay. Some enters the bay, and some crosses the bay along and outside the Gull Island shoal. While the most immediate nearshore area downwind of Endicott may thus remain primarily fresh (Figure 10), marine bottom water flowing in past the northwestern tip of the causeway upwells in the shallows between the causeway and shore (Figure 11).

The marine upwelling occurring at the Endicott causeway extends in a band to the south and west of the causeway's tip, occasionally to Heald Point. Depending on the strength of the wind, marine water also upwells to the east along the inside of the inter-island causeway as far as the west side of the island-to-shore leg of the structure (Figure 11). Both the intensity and the overall extent of the marine upwelling significantly exceeds the Endicott project EIS predictions (COE, 1984). Salinity differences of 20 ppt have been observed between the plume water on one side of the causeway and upwelled water on the other side - an impact three times greater than predicted in the EIS (Envirosphere, 1988c). The EIS also predicted significant water quality changes would occur within an area of about 11,000 acres; EPA has calculated that the area affected has actually exceeded 40,000 acres considering both east and west wind conditions.

The offshore deflection of coastal water and the marine upwelling along the delta front separate the coastal water from much of the Sagavanirktok River's fresh discharge for several kilometers. Prior to the Endicott causeway, the river discharge mixed directly with the coastal water (see Figure 3), helping to maintain the estuarine conditions across the Prudhoe Bay area (NOAA,

1988). Today these water masses are separated, and each of them is in greater contact with marine water (Envirosphere, 1988a; Envirosphere, 1988d). Thus, mixing causes each to become more marine in character as it moves through the area (Figure 12).

At the West Dock causeway, surface water immediately downwind of the structure and within the lagoon system is also blown west at the same time that estuarine water is deflected offshore. Unlike the Endicott causeway system, however, there is no significant nearby source of fresh water to partially replace the deflected water. Instead, the deflected water is entirely replaced by marine water from offshore that upwells directly into Stump Island Lagoon. Consequently, the West Dock causeway causes a much more extensive invasion of marine conditions into the nearshore zone. Marine water upwelled as a result of the causeway can extend throughout Gwydyr Bay (some 20 to 35 kilometers) and routinely dominates beyond the Kuparuk River Delta (approximately 15 kilometers).

The overall impact of the West Dock and Endicott causeways during easterly winds is that the zone of estuarine water that had dominated the nearshore area between the Colville and the Sagavanirktok rivers in the pre-causeway environment is no longer continuous under even relatively low intensity east winds. In the absence of the causeways, water would not be deflected offshore and marine water would not frequently dominate the lagoon system west of Prudhoe Bay as it does today (NOAA, 1988).

West Winds: Intrusion During westerly winds, the mass of upwelled marine water dominating the lagoon system west of the West Dock causeway begins to flow east around the causeway toward Prudhoe Bay (Figure 13). As this occurs, water level rises in an intrusion event (see Physical Environment, above). The intrusion ends relatively quickly as water level equilibrates, but usually not before the more estuarine water that had occupied Prudhoe Bay is displaced by the marine water flowing in from the end of the West Dock causeway (Envirosphere, 1988c; NOAA, 1988). Distinct boundaries between receding estuarine water and incoming marine water are observed at these times. In this manner, marine conditions regularly occur in Prudhoe Bay as a result of the West Dock causeway.

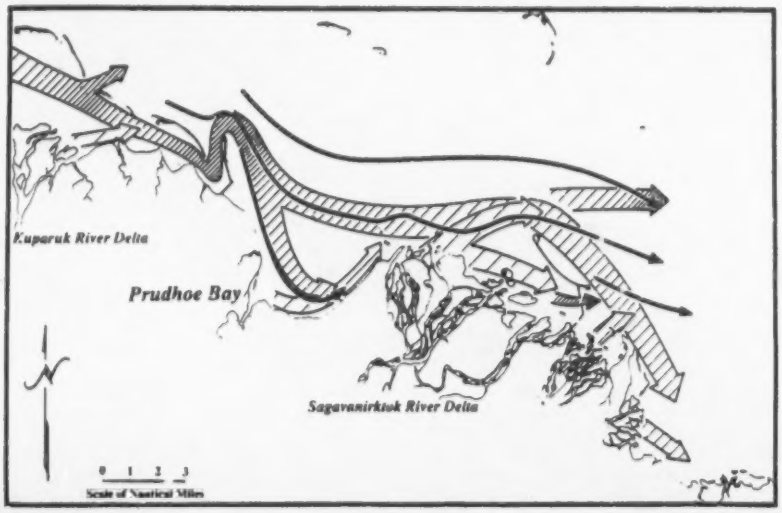

Figure 13
Generalized flow of nearshore waters during sustained westerly winds since construction of the West Dock and Endicott causeways, showing causeway-induced deflection of nearshore water masses. Heavy solid arrows denote flow of subsurface marine water. Cross-hatched arrows denote surface flow, with the density of cross-hatching proportional to salinity. Adapted from Envirosphere, 1988b and NOAA, 1988.

If west winds persist, the Colville River plume will eventually flow through the lagoon system, reaching and passing around West Dock. This was observed in 1984 and 1987. However, meteorological records for the area indicate that such conditions are unusual (Envirosphere, 1988d). Unfortunately, even when they do occur, the Colville River plume is able to do little to flush marine conditions from Prudhoe Bay, since most of the plume's flow during westerly winds (after the active intrusion ceases) occurs outside the Gull Island shoal as a result of bathymetric steering (NOAA, 1988). The first major marine intrusion event of the season can thus adversely affect Prudhoe Bay water quality for the remainder of the open water period (Envirosphere, 1988b; Envirosphere, 1988d; NOAA, 1988).

After passing Prudhoe Bay, coastal water (and at times Colville River plume water) is also deflected offshore by the Endicott causeway (Figure 13). As also occurs during easterly winds, the 700 feet of breaching in the structure is inadequate to accommodate more than a small fraction of this water. Some degradation of the estuarine conditions of the deflected water occurs during westerly winds as well. At these times, west channel Sagavanirktok River water is forced to mix both with marine water previously upwelled by the Endicott causeway and with offshore marine water as the plume is deflected around the causeway. Water from the east channel of the river also mixes with previously upwelled marine water rather than with fresh water from the west channel. In addition, being in the protected lee of the causeway during westerly winds, east channel water flows further from shore out over marine waters, rather than flowing southeast into southern Foggy Island Bay.

Fragmentation of Water Masses A net effect of the causeways, considering both east wind and west wind impacts, is that nearshore water masses frequently become separated from like masses along the coast. This water mass fragmentation would not occur naturally under the same meteorological conditions, except perhaps during unusually harsh years (e.g., low river discharges, cold temperatures). The large expanse of upwelled marine water within the Simpson Lagoon system, for instance, now routinely isolates the estuarine conditions of the Prudhoe Bay area from similar estuarine conditions maintained farther to the west by the Colville River. As a result, each of these areas is less accessible to feeding or migrating anadromous fish (see Biological Impacts, below). This east-west fragmentation of conditions within the nearshore zone, while dominant during easterly winds, also persists during westerly winds. During the first days of westerly winds, the upwelled marine water continues to fragment the nearshore water masses, but the location of the discontinuity is simply moved to the other side of the West Dock causeway (i.e., into Prudhoe Bay).

The Endicott causeway also fragments water masses because of its location within the Sagavanirktok River delta. Because this structure causes marine water to upwell between the fresh river discharge and the deflected brackish coastal water, a north-south fragmentation of nearshore water masses occurs. This fragmentation results in enhanced mixing between marine and coastal water, direct mixing between fresh river water and upwelled marine water in the nearshore zone, and a general degradation of habitat quality for the area's anadromous fish populations (see Biological Impacts, below).

Each of the other causeways that have been proposed for the Prudhoe Bay area would exacerbate the water quality impacts described above. The Lisburne causeway would have made marine waters even more difficult to flush from Prudhoe Bay. The Niakuk causeway would likely enhance the amount of marine water upwelled near Prudhoe Bay during easterly winds and would add to the offshore deflection of coastal plume water under westerly winds. The Niakuk causeway could significantly increase the rate of intrusion of marine water into Prudhoe Bay, as well as make resulting marine conditions more difficult to flush from the bay. Overall, the Niakuk and Endicott causeways together would be more problematic than either of them individually.

Ice Dynamics The West Dock and Endicott causeways have affected ice dynamics in the Prudhoe Bay area by deflecting and restricting the early season overflooding of river water, thereby altering the natural patterns of sea ice breakup (Figure 14). The breakup of sea ice in the vicinity of each causeway has been delayed by up to two weeks (Envirosphere, 1988b; Envirosphere, 1988d; NOAA, 1988). Freeze up, however, is locally accelerated by the structures. Depending on wind direction, ice builds up behind the causeways and can solidify more quickly there, causing freezeup to occur up to two weeks earlier than elsewhere in the area (Envirosphere, 1988d; NOAA, 1988).

These alterations in breakup and freezeup patterns occur primarily within about 5 km of the causeways (NOAA, 1988). However, this effect is directly within the nearshore zone used by anadromous fish. Alteration of ice dynamics within this important ecological zone represents a

risk to these fish (see Biological Impacts, below).

The proposed Niakuk causeway would also alter

Figure 14
Distribution of flood waters from the Kuparuk and Sagavanirktok rivers, from LANDSAT image of May 30, 1985. The West Dock causeway can be seen to restrict overflooding to western Prudhoe Bay. Adapted from NOAA, 1988.

ice dynamics. The proposed structure extending from Heald Point would further restrict river overflooding into Prudhoe Bay and breakup of sea ice within the bay. It would also accelerate freezeup in the nearshore zone and within the west channel of the Sagavanirktok River. The limited breaching proposed for this structure is not expected to be capable of eliminating these effects.

BIOLOGICAL IMPACTS

Important feeding and rearing habitat for anadromous fish in the Prudhoe Bay area has been significantly altered due to the presence of the West Dock and Endicott causeways. Marine water dominates or modifies conditions across many kilometers of the coast, and both the quality and quantity of suitable feeding and rearing habitat have been substantially reduced. In addition, oceanographic changes associated with the causeways have fragmented fish habitat both near Prudhoe Bay and along the coast as a whole, affecting fish migration and distributions. Causeway-induced habitat impacts and alterations in ice dynamics occur directly within the critical nearshore zone, and are now making every year more similar to a "harsh" year as described earlier.

Serious risks to the fish populations are posed by these habitat impacts. Habitat alterations can lead to overutilization of accessible areas and underutilization of inaccessible areas. This change in utilization can translate into reductions in feeding and therefore growth for these populations that are already energetically limited. Taken together, these changes can greatly impact the populations and the overall coastal fish community, even in the absence of catastrophic or worst-case events or years.

Causeway Effects on Population Sizes Little or no reliable information exists about population sizes for the nearshore fish species of the central Beaufort Sea. Thus little direct evidence of declines in population sizes can be cited. However, some may question why this should remain the situation after several years of causeway monitoring. First, it is important to recall that causeway monitoring, by design, has largely been habitat-based (see Causeway Monitoring Programs, above). It is therefore possible that population declines have already begun to occur that are simply going unmeasured. (It would take a very large decline indeed to be obvious, given the habitat focus of the monitoring to date. Once very large population declines occur, it is usually too late to easily reverse them.) Second, and perhaps more important, is that reasonably comprehensive monitoring has actually been conducted only for four years, or about one-half the generation time for the affected fish species. Since these fish take 8 to 12 years to mature, it would take at least that long for the populations to decline obviously in the absense of acute, catastrophic effects. While long-term declines may be more probable than catastrophic effects, the latter can also occur under the appropriate set of conditions. This cannot be discounted given the intended life of the causeways.

Causeway Effects on Habitat Quality and Quantity The alteration of coastal and Sagavanirktok River plume water quality that results from offshore deflection of these water masses at the West Dock and Endicott causeways also represents a degradation of habitat quality for anadromous fish. These fish are highly dependent on estuarine conditions in the nearshore waters (see Biological Environment, above). As described earlier, the causeways have displaced much of this habitat offshore where its quality is rapidly degraded and replaced it with unsuitable marine water.

In addition to the degradation of fish habitat, the West Dock and Endicott causeways have reduced

the total amount of suitable habitat available. This is true in terms of both the area occupied by suitable habitat under a given set of conditions and in terms of the overall time during which suitable habitat is available.

During both easterly and westerly winds, unsuitable marine conditions dominate large areas that once provided generally continuous estuarine habitat. For example, it is estimated that during prevailing easterly winds the Endicott causeway results in the loss of at least 60 percent of the shallow (<2 meters) estuarine habitat that would otherwise exist in the western Sagavanirktok River delta (Envirosphere, 1988d). Similarly, the West Dock and Endicott causeways combined are estimated to cause the loss of approximately 50 percent of the anadromous fish habitat of the overall Endicott monitoring program study area (from Foggy Island Bay west through Gwydyr Bay (Envirosphere, 1988d). This is consistent with EPA's calculations, based on oceanographic survey data, that up to 365 square kilometers of the nearshore zone that had provided estuarine habitat prior to construction of the causeways have been affected.

Marine conditions, together with altered ice dynamics within the zone used by fish during migrations between overwintering areas and summer rearing areas, also reduce the total amount of time during which suitable habitat is available. These reductions in habitat quality and quantity have resulted in altered fish use of the Prudhoe Bay area, probable decreased feeding efficiency, and decreased potential for overwinter survival, growth, and reproduction.

Changes in Fish Use of the Prudhoe Bay Area The increased fragmentation of water masses that results from the Endicott and West Dock causeways translates to increased fragmentation of anadromous fish habitat. West Dock in particular creates a discontinuity in the nearshore fish habitat by enhancing upwelling of marine water during east winds (the most common winds during the summer). Eastward-moving fish from the Colville River area have been observed to retreat back to the west upon encountering marine water upwelled in the lagoon system west of the West Dock causeway (Moulton et al , 1986; Envirosphere, 1987). Fish within Prudhoe Bay are similarly blocked from moving west by this expanse of inhospitable marine water. This isolation of fish on either side of the causeway can affect return migrations to overwintering areas as well as distributions to and between rearing areas (Envirosphere, 1988b; Envirosphere, 1988d). Overcrowding on one side of the causeway will result in a reduction in feeding efficiency.

Similarly, if preferred overwintering sites are made inaccessible at the critical time, the fish will not reach a suitable site or may be forced to use less suitable areas. As described earlier, the Colville River delta is the primary overwintering area for most of these fish. Delays in the return migration to the Colville River have in fact been observed at West Dock during east winds (Envirosphere, 1988b). The extent to which such delays have forced fish to attempt overwintering in unsuitable areas is unknown. However, in the winter of 1985/1986 a large number of Arctic cisco attempted to overwinter in an apparently unsuitable area of the Sagavanirktok River, and died when oxygen levels dropped (Schmidt et al , 1987; Envirosphere, 1987).

Changes in fish distribution and use of Prudhoe Bay occur during west winds, as well. The marine water previously upwelled west of West Dock flows back around the causeway when the wind shifts to westerly, and marine water fills Prudhoe Bay from the west to the east (see Physical Impacts, above). This drives the anadromous fish that had been feeding in the bay, especially Arctic and least cisco, toward the fresh water of the Sagavanirktok River delta where they can find refuge from the marine conditions (Envirosphere, 1988b; Envirosphere, 1988d). However, all of the time spent in refuge areas is time not spent feeding in more productive estuarine habitat; growth potential for these fish will therefore be reduced in proportion to time spent in refuge.

At the same time, the fresher water nearest the delta is the usual habitat of the broad whitefish. It is unknown at this time whether the increased use of the delta by other species results in overcrowding or overutilization of the broad whitefish habitat. However, sampling from 1982 through 1987 suggests a reduction in the strength of younger age-classes corresponding to post-causeway years of altered environmental conditions (Envirosphere, 1988d).

Changes to Community Structure The composition of the nearshore fish community of the Prudhoe Bay area has changed dramatically since construction of the West Dock and Endicott causeways. Where least cisco once dominated and freshwater species such as round and humpback whitefish were regularly found (see Biological Environment, above), these species now comprise a relatively small portion of the fish sampled. Instead, marine species - primarily Arctic cod - have become dominant overall. At the same time, Arctic cisco have become the dominant anadromous fish in Prudhoe Bay. In general, the nearshore fish community is now characterized mainly by a combination of marine species and

anadromous species more tolerant of higher salinities, while fresher-water species have all but disappeared.

These changes are consistent with the dramatic causeway-induced changes in the physical conditions of the nearshore environment described earlier. In particular, they are consistent with a basic alteration in the balance of fresh and marine waters that had previously defined the estuarine character of the nearshore zone. Odum (1971), in a discussion of estuarine ecology, states that it "is self-evident that different circulation patterns and gradients will greatly influence the distribution of individual species, but so long as there are adapted populations the overall productivity need not be greatly affected by these differences." The nearshore environment of the Prudhoe Bay area now clearly experiences different circulation patterns and gradients as a result of the West Dock and Endicott causeways, and the distribution of individual species has certainly been affected. It is also possible that overall productivity has not substantially changed. However, that productivity has shifted from anadromous and freshwater fish to dominance by marine species - especially Arctic cod.

Bioenergetics To the extent that fish use and habitat of the Prudhoe Bay area have been altered by the causeways, several biological impacts are probable. All of these impacts are directly or indirectly related to bioenergetics: the ability of fish to aquire and store sufficient energy for survival, growth, and reproduction. If sufficient energy is not acquired and stored during each brief summer feeding period, the populations will decline.[2/] The West Dock and Endicott causeways have seriously increased the probability that this will occur. This discussion presents some of the bioenergetic impacts and risks that anadromous fish now face as a result of causeways in the Prudhoe Bay area.

Implications of Temperature and Salinity Changes Causeway-irduced temperature and salinity conditions are within the overall range that naturally occurs across the region. This statement would always be true - regardless of the degree of causeway-induced impacts - because causeways neither create nor destroy heat or salt. However, not all water quality conditions within the range found across the region are suitable for use by anadromous fish. For example, nearshore conditions range from liquid to solid but, of course, solid ice does not serve as habitat for anadromous fish. Even during the open water period, some "natural" conditions in the region are often outside the range of physiological tolerance for some fish species. Exposure to conditions within but near limits of tolerance may allow fish to survive, but will exact high metabolic costs (Brett, 1971; Smith, 1982). Even minor deviations (e.g., 2-5°C) from "optimal" conditions can have significant effects on growth and reproductive potential (Magnuson et al., 1979). Whether in Arctic or temperate regions, a fish's potential for achieving an overall net energy gain that is sufficient for overwintering, growth, and reproduction will be directly reduced by both the degree and persistence of extreme conditions (Brett, 1976).

Arctic anadromous fish are not immune to these consequences. Growth rates of broad whitefish in the Prudhoe Bay area appear to be greater, on average, during west wind years when warmer temperatures and/or lower salinities have been more predominant throughout the summer feeding period (Envirosphere, 1988d). This indicates that water quality conditions integrated over the entire region and over the entire summer can affect the overall health and condition of Arctic anadromous fish populations. This is to be expected because west winds keep warm, fresh water nearshore, therefore resulting in generally higher temperatures and lower salinities. In contrast, east winds promote stratification, upwelling, and increased marine influence on the nearshore zone throughout the region.

However, as described earlier, fish do not respond directly to average or regional conditions; they must attempt to achieve the best compromise

2/ Some investigators suggest that overwintering habitat is the only true limitation to the size of Arctic anadromous fish populations. This would be due to physical limitations such as water quality (including dissolved oxygen) and space (Schmidt et al., 1987). Physical factors would be expected to often become limiting in marginal overwintering areas (for example, if higher numbers of fish are forced to attempt overwintering in less dependable sites due to causeways blocking or delaying migration to preferred Colville River sites). In fact, a water quality-related fish kill has been observed in a marginal area of the Sagavanirktok River (Envirosphere, 1988d). However, dependable, regularly used (e.g., Colville River delta) overwintering areas, by definition, should be physically capable of supporting the populations in most years and should not routinely limit the populations directly. (For example, it would be expected that severe dissolved oxygen depletion would affect all the fish in a given overwintering pool - not just a few.) However, in especially harsh years, overwintering may be directly limiting.

It is important to keep in mind that successful overwintering must occur not just in any one year, but in all years if survival to reproduction is to occur for populations to be maintained. If energetic constraints significantly disrupt this continuum at any point, the populations will decline and can even crash. Thus, even if causeways were to significantly impact fish energetics only irregularly, these events would be capable of severely affecting the population over the long term.

between several aspects of their immediate surroundings. Salinity, temperature, and prey availability are perhaps the most important of these. Monitoring programs have observed that many Arctic anadromous fish avoid marine conditions in the Prudhoe Bay area (Envirosphere, 1987; Envirosphere, 1988d). This is a direct indication that these fish, in fact, do not utilize all the conditions that naturally occur within the region.

The changes in fish distribution and use of the Prudhoe Bay area are examples of immediate behavioral responses to adverse conditions. Such behavioral responses are not without cost, however. As stated earlier, time spent in refuge areas is time not spent feeding in more suitable estuarine habitat. A reduction in the amount of time foraging will affect the scope for growth for that year. Just as east-wind-dominated years can naturally limit growth by degrading conditions on a regional scale, the more local effects of causeways within the critical nearshore habitat zone reduce the time spent feeding in high quality habitat and also affect scope for growth.

Even when drastic water quality changes do not occur and fish are not forced to take refuge, the quality of feeding habitat in the Prudhoe Bay area is often degraded by the presence of the causeways. This occurs because the brackish coastal water is deflected at each causeway, resulting in increased mixing with marine water and an overall decrease in temperature and increase in salinity. Therefore, even though fish are not always forced to completely abandon the feeding area, the energetic costs of remaining there are greater and less net energy gain is possible.

The frequency of such episodes will vary from year to year, as will the degree of degradation of feeding habitat quality. However, since energy is already a direct limitation, fish will be affected to some extent each year. Reduced health and condition (fat reserves) of individuals translates into population impacts if overwintering mortality increases, age of maturity is delayed, or fecundity is reduced.

Food Availability It has been estimated that the abundance of food organisms used by the anadromous fish greatly overshadows what the fish could possibly consume (Craig and Haldorson, 1981; Moulton et al., 1986). However, abundance is not the same as availability. Only those organisms that are available to the fish can possibly become food; and abundant food in one area is not available if surrounding water quality conditions deny the fish access to it. Beyond this, not all food organisms within a given patch of accessible habitat are necessarily available to all species and size-classes of fish. An abundance of food types preferred by one fish does not mean that other fish in the area can use them. The fact that Arctic populations of anadromous fish grow and mature more slowly and cannot spawn in consecutive years clearly indicates that energy is a limiting factor for them (abundance of food notwithstanding). Important supporting evidence has come from fish stomach sampling. Each year of monitoring has found a significant percentage of empty stomachs (Envirosphere, 1987; Envirosphere, 1988d; Envirosphere, 1988e). Given that food organisms, overall, are highly abundant, empty stomachs are a strong indication that food intake is not always high and that food is not effectively unlimited.

In addition to such natural energetic limitations, evidence has been collected through causeway monitoring programs indicating that the causeways have further limited the energy available to anadromous fish. For example, 1985 sampling found that for an abundant year-class of Arctic cisco, the size of individual fish in the Prudhoe Bay area was significantly smaller than that of individuals of the same year class captured outside the area. A smaller size-at-age can result from differential feeding success. The size difference did not reappear in the 1986 sampling, and it is unknown whether these smaller fish were too weak to survive the winter and thus disappeared from the population. However, a large mortality did occur during the winter of 1985-1986 in the Sagavanirktok River (Envirosphere, 1987c). The apparent downward trend to the Sagavanirktok River broad whitefish population may also be a result of a reduction in food availability, either due to a reduction in available habitat or due to competition from other displaced anadromous fish. The dramatic shift in the make-up of the overall nearshore fish community also indicates that feeding opportunities for fresher-water species have been reduced. However, lack of monitoring emphasis on these species limits the ability to determine whether they have suffered population declines.

Consequences of Reduced Energy Intake There are serious ramifications to causeways further limiting the net energy intake potential for the anadromous fish populations. In the immediate sense, fish are at risk of not acquiring enough fat reserves to survive the subsequent overwintering period. A year in which this occurs for some percentage of any population will result in a direct and immediate decline in overall population size by the same percentage. If such a decline is sufficient to overshadow any compensatory mechanisms that may exist, the affected

population could take several decades to recover even if no further increase in overwintering mortality were to occur in subsequent years (EPA, 1985).

Significant but less immediate impacts could also occur if conditions in a given year are not so severe that overwintering mortality occurs, but are still severe enough to reduce growth. Only one such year per generation might be necessary to delay the age at which the affected fish reach maturity and spawn. Delayed maturity for a substantial proportion of any of the fish populations also can result in a direct decline in population size; however, it would not become evident until several years later when the affected age-class matures. Again, the population could require several decades to recover even if there were no further effects to other age-classes. Of course, if such conditions were to recur during subsequent generations, recovery would not proceed at all; and if such conditions occurred more than once to a single generation, the intensity of the impact would be multiplied. The same types of effects could result from a reduction in fecundity as well (which also can result from reduced net energy intake and reduced size) even if maturation is not delayed.

Taken together, causeway-induced alterations in circulation patterns, water quality, and ice dynamics - occurring as they do directly within the critical nearshore zone - now make every year more similar to a naturally harsh year. This means that long-term declines in the populations of central Beaufort Sea anadromous fish are likely. Should truly harsh years be in store, catastrophic impacts to these populations - and the fisheries they support - may quickly occur. Given the lack of reliable information on population sizes and the fact that monitoring programs have not been designed to measure population sizes directly, it is possible that significant declines have already begun to occur.

RESEARCH NEEDS

After several years of fairly intensive field investigation, much remains to be learned about the nearshore environment of the Prudhoe Bay area. Research opportunities exist in terms of both oceanographic and fisheries issues.

Now that a reasonable basic understanding exists of the physical processes that dominate in the nearshore zone, it should be possible to accurately model them mathematically. Three-dimensional computer-based circulation modeling has been recommended for adequately describing and predicting impacts of existing and proposed nearshore structures (NOAA, 1988). To be useful, such modeling should be capable of sufficient resolution to simulate local oceanographic processes and interactions, and should possess a sufficient number of internal test points to allow evaluation of a variety of scenarios. In addition, an appropriate model would need extensive calibration and verification using field-collected data prior to implementation. Computer modeling has been applied to Prudhoe Bay area causeway issues in the past; however, it has been highly controversial. True state-of-the-art modeling, thoroughly reviewed and approved by appropriate governmental agencies, should be capable of accurately simulating Prudhoe Bay area conditions. Such a model would prove an important tool for decision-making, but could take several years to fully develop.

In addition to modeling, oceanographic field surveys of the nearshore zone outside the boundaries of the Endicott monitoring program study area are needed. Some study related to offshore oil and gas leasing programs is ongoing, but the level of intensity is far short of what is desirable for site-specific decision-making. In general, much more information about nearshore oceanographic processes and hydrographic conditions across the entire Beaufort Sea coast is needed.

A substantial amount of research remains to be conducted on Beaufort Sea fish and fish populations - much of it basic in nature. Some stock identification work is ongoing, but further work would be important. In particular, an enhanced international effort to identify spawning areas for Arctic cisco in the Mackenzie River basin, and to determine whether discrete spawning populations exist, is needed. Distribution and abundance information for the fresher-water species that appear to have basically disappeared from Prudhoe Bay sampling is important to acquire, and reliable population-level data for all nearshore species would certainly be useful. The latter may continue to be difficult to effectively gather, given the importance of tagging to the effort and the extreme sensitivity of some species to the tagging methods so far employed.

Laboratory study of basic physiological responses of the different fish species (and life history stages) is basic information that is particularly lacking. Some studies have been performed and others are ongoing, but investigation into these areas is in its infancy for Beaufort Sea anadromous fish. Too often, such studies are directed at specific, narrow questions and at the same time the data they generate are interpreted too broadly. It is important that basic physiological and behavioral studies continue, but extreme caution should be

exercised in any attempts to directly interpret field observations with limited laboratory data.

The single most important type of data needed, however, is adequate site-specific environmental baseline data concerning any new projects proposed for the Beaufort Sea's nearshore zone. This cannot be over-emphasized. The lack of adequate baseline data has been the most serious limitation to decision-making for Prudhoe Bay area causeways to date, affecting initial permitting decisions, the design of the monitoring programs, the effectiveness of the monitoring, and ultimately decisions about mitigation. Effective and timely decisions can only be made where a basic understanding of the affected environment exists. By conducting several years of intensive monitoring, a basic site-specific understanding of the nearshore Prudhoe Bay environment is now available. Ensuring that it also exists for future construction proposals throughout the nearshore zone of the Beaufort Sea is the best way to ensure that unnecessary and irreparable impacts to the aquatic environment can be avoided.

CONCLUSION

The nearshore estuarine conditions of the Prudhoe Bay area are critical feeding and rearing habitat for many central Beaufort Sea anadromous fish. The West Dock and Endicott causeways have significantly altered the balance of fresh and marine waters throughout this area, fundamentally altering water quality and circulation patterns along as much as 65 kilometers of coastline. The Arctic fish populations affected by these oceanographic changes are already naturally limited by their environment to the extent that they are slower growing and maturing than more southern populations. Causeway-induced habitat changes further limit the ability of these fish to obtain sufficient energy for overwintering survival, growth, and reproduction.

The causeway monitoring programs have been designed around the premise - basic to ecological study worldwide - that suitable habitat is a necessary prerequisite to healthy populations. In addition, such an approach allows mitigation decisions to be made before population-level impacts have already become irreversible, whereas simple monitoring of population sizes generally does not. As a result, post-causeway monitoring programs have not directly measured population sizes for the anadromous fish species of the Prudhoe Bay area and little or no reliable information about population sizes exists. Therefore, claims about there being a lack of evidence for population-level impacts are misleading. It is possible that significant declines are already occurring for some species, and that this is simply going unmeasured. In fact, monitoring programs have identified a variety of indicators showing that this may be the case. These indicators include: 1) basic changes in the structure of the nearshore fish community to one dominated by marine and relatively salt-tolerant species, with freshwater species having all but diasppeared; 2) reduction in the strength of young age-classes of Sagavanirktok River broad whitefish since 1981; 3) smaller size-at-age for a large cohort of Arctic cisco in the Prudhoe Bay area in 1985, together with evidence that they may not have survived overwintering; and 4) evidence (including stomach sampling) that food organisms are not effectively unlimited.

In effect, the West Dock and Endicott causeways make each year similar to a naturally harsh year, wherein disruption of fish habitat decreases the potential for survival, growth, and eventual reproduction. The probability of population-level impacts is not presently quantifiable, but is believed to be substantial given the variability in weather and oceanographic conditions that can be expected over the life of the causeways. Ultimately, the individual anadromous fish, their central Beaufort Sea populations, and the overall nearshore fish community are at risk.

Eventually, the causeways could seriously harm subsistence and commercial harvests in the Arctic. These fish are also an international resource, supporting subsistence users in both the United States and Canada, and playing an ongoing role in the native cultures of the American Arctic. Restoration of natural nearshore circulation and water quality would be required in order to reduce the risks faced by central Beaufort Sea anadromous fish. In contrast, construction of additional causeways in the area would significantly increase the existing impacts and risks.

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Question from Senator Wirth

QUESTION: In contrast to the information about oil development effects on birds presented by oil company witnesses at the hearing, I understand that brant and other waterbirds no longer raise their broods in the vicinity of ARCO's Kuparuk Central Processing Facility 3. Please provide information about the bird monitoring program required in the NPDES (Clean Water Act) permit for this facility, and mitigation recommendations made by the Fish and Wildlife Service and the Environmental PRotection agency based on the results of the monitoring.

ANSWER: A draft report entitled "An Evaluation of the Effects of Noise on Waterfowl in the Vicinity of CPF-3, Kuparuk Field, Alaska," is currently undergoing peer review. This draft document (prepared by ARCO Alaska, Inc., and Paul D. Hampton, ESE) indicates that brant no longer raise their broods in the vicinity of the Kuparuk Central Processing Facility 3. Based on this draft, the Service is in the process of formulating mitigation recommendations to the Environmental Protection Agency as required by the National Pollution Discharge Elimination System Permit.

Question from Senator Wirth

QUESTION: What is the current status of rehabilitation of native tundra vegatation at the exploratory drill pad on Kaktovik Inupiat Corporation land (the "KIC well")? Has the pad and its reserve pit been successfully reclaimed?

ANSWER: There is substantial revegetation at the Kaktovik Inupiat Corporation well pad. The reclamation program has been largely successful. There are areas where there is slumping with ponding over the reserve pit which will require further rehabilitation. In addition, there are localized areas showing minor contamination.

Question from Senator Wirth

QUESTION: At the hearing, Mr. Herrera described a bioaccumulation study conducted by industry. What information does the Department have about this study? Has the Department carried out any follow up investigation to the West and Snyder-Conn study which found evidence of bioaccumulation of contaminants? If so, what have been the results of such studies?

ANSWER: The Service reviewed and commented on the draft report, "Bioaccumulation of heavy metals, salts and hydrocarbons in lower-trophic levels in the Prudhoe Bay and Kuparuk Fields, 1988." A copy of these comments is being provided. The Service has conducted no follow-up investigation to the West and Snyder-Conn study dated 1987.

IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
NORTHERN ALASKA ECOLOGICAL SERVICES
101 12th Ave., Box 20, Room 232
Fairbanks, AK 99701
February 15, 1989

Mr. Steven D. Taylor, Manager
Environmental and Regulatory Affairs
British Petroleum Exploration (Alaska) Inc.
P.O. Box 196612
Anchorage, Alaska 99519-6612

Dear Mr. Taylor:

At your request, Dr. Elaine Snyder-Conn, Environmental Contaminants Specialist for the U.S. Fish and Wildlife Service (Service) has reviewed the draft report, "Bioaccumulation of heavy metals, salts and hydrocarbons in lower-trophic levels in the Prudhoe Bay and Kuparuk Fields, 1988," prepared by Environmental Science and Engineering, Inc. (ESE), for British Petroleum Exploration (Alaska) Inc. Our office has the following comments.

In general the document is clearly written and needs no changes in terms of organization or writing style, except for inclusion of addition data summaries on bioassimilation and invertebrate community data by site and by species. There were a few omissions of words and typographical errors, but these will undoubtably be addressed by other reviewers. Therefore, we will restrict comments to methods, and to the content and interpretation of data.

First, it would be helpful to outline differences between published U.S. Fish and Wildlife Service studies (West and Snyder-Conn 1987, Woodward et al. 1988) and the present study. Many of these differences should be noted in the ESE report. The most obvious difference is that Service studies were conducted within one to two months after actual tundra discharges of reserve pit fluids; the ESE study examined sites 1-4 years after the last discharge (except seepage sites). More drilling activity occurred on drill pads during the earlier studies also. Therefore, it is not surprising that greater contamination by many cations, anions, and hydrocarbons was documented in water and soil in the former studies. Since Service studies were conducted soon after discharges, they are more applicable to understanding immediate impacts from accidental and permitted discharges of reserve pit fluids into tundra wetlands; however, the ESE study is also useful in documenting long-term impacts, particularly on vascular plants and phytoplankton. Neither study is applicable to understanding cumulative impacts of multiple discharges at the same site. A cumulative impact assessment would require tracking of the volume and quality of wastes discharged over multiple years, and changes over the same time period in the biota.

Secondly, the analytical methods for metals analysis in the three studies are often not comparable. The West and Snyder-Conn study examined metals using atomic absorption (including flameless, graphite furnace and cold vapor methods, as needed) for total metals in both water and sediment. The Woodward study examined only dissolved metals in water (but total metals in sediment) using digestions in a Parr bomb with Ultrix and inductively coupled plasma emission spectroscopy. Digestions were therefore complete. The ESE study examined both total and dissolved metals in water by inductively coupled plasma emission spectroscopy also, but the digestion procedure was less complete. Also, detection limits for metals in water (mg/L) varied considerably for the three studies, as follows:

	ESE	West and Snyder-Conn (1987)	Woodward et al. (1988)
Ag	0.05	-	-
Al	0.05	0.005	<0.04
As	0.01,0.005	0.001	-
B	0.05,<0.02	-	0.01
Ba	<0.07	0.05	0.01
Br	<0.05	-	<0.09
Cd	<0.05	0.0001	0.006
Cr	0.01	0.0005	0.04
Cu	0.05	0.0005	0.006
Hg	0.0001	0.0004	-
Ni	0.05	0.005	0.02
Pb	0.05	0.0005	0.06
Se	0.05	0.001	-
Sb	-	-	0.05
Zn	<0.04	0.0001	0.02

Note that some of the ESE detection limits for heavy metals, notably for silver, hexavalent chromium, lead, and copper, are at or below EPA water quality criteria, especially for the chronic value for protection of aquatic life. Hence, conclusions regarding whether EPA ambient water quality criteria are violated cannot be made from ESE data for these metals.

Another important difference in the studies was in the analysis of hydrocarbons. The ESE analyses were for total petroleum hydrocarbons using an infrared methodology and for volatile aromatic hydrocarbons (benzene, toluene, and xylene). Service analyses were more detailed and included GC or GC/MS analyses of specific aliphatic, alicyclic and the less volatile polycyclic aromatic hydrocarbons. The Service did not include volatile monoaromatics as did the ESE study, since volatile compounds would not be expected to remain on site at significant concentrations over time. Significant concentrations of polycyclic aromatic hydrocarbons were found at several discharge sites in both Service studies, and the Woodward et al. investigation linked the presence of polycyclic aromatic hydrocarbons to increased mortality and chronic impacts on Daphnia in both in situ and standard chronic life cycle testing. The ESE draft report frequently fails to differentiate between polycyclic and monocyclic aromatics and therefore makes several misleading statements regarding absence of aromatics from samples, when, in fact, only the benzene-toluene-xylene fraction was analysed.

Study designs also varied considerably. Both Service studies included three control sites. In the West study, conductivity was used as one of several criteria to screen controls, and a fourth control quite close to the coastline was omitted due to the high salt content (and very different invertebrates) found in the sample. In the Woodward study, controls were selected so as to be approximately the same distance from the coast as drill sites sampled, and control sites were scattered from west to east across the Prudhoe oilfield. The ESE study included more drill sites, but only two controls. The nature and location of these control locations was quite surprising. One was far south of the oil field in an upland area under a much different chemical regime; the other control along the West Beach road was closer to the coast than any treatment site and undoubtably under coastal marine influences.

There were several very curious characteristics of the first control site. It contained anomalously high amounts of total petroleum hydrocarbons at precisely the same concentrations in both surface and ft-deep soil samples, and undetectable arsenic in the surface sample, but a very high arsenic concentration one foot deep. The chloride concentrations were also of interest. Comparatively high

levels occurred on the surface, but not at the one-foot level. These discrepancies suggest that the site may have experienced some contamination in the past. A good test of this hypothesis would be to analyze a soil sample for the ratio of n-heptadecane to pristane, or phytane to pristane, and to examine odd-even carbon preference, presence of alicyclics, and distribution of carbon compounds. The distribution and abundance of the various compounds has been recognized as a good means of distinguishing natural and anthropogenic oil (e.g., National Research Council 1988). Additional information on this site is desirable, including proximity of exploration sites and materials sites, as well as any on-the-ground observations by ESE. Since some of the diversity studies entailed summing numbers of species from the same treatments such as controls versus discharge, seepage and other sites (e.g., Table 3-11, Page 76), the low number of controls versus other treatment sites led to a built-in study bias in this type of analysis.

The community diversity studies of West and Snyder-Conn (1987) and the present study also differed considerably. In the Service study, the H' diversity measure was applied to taxa, rather than species, to cope with the difficulties of taxonomy of arctic invertebrates. This study included aquatic insect larvae, which were apparently omitted in the ESE study. Whether other aspects of the studies differed is unknown, since no invertebrate abundance data by species or by treatment are presented in the text. Such a presentation is needed.

A final difference between the current study and previous Service studies involves the bioassay work. Woodward et al. (1988) performed 96-hr in situ tests with D. middendorffiana, 48-hr standard laboratory acute toxicity tests with D. magna, and 42-day chronic toxicity tests with D. magna. The discussion of the Woodward study results in the ESE report should also be augmented to include standard acute and chronic toxicity findings. Controls for the in situ work consisted of Daphnia collected from one of three control ponds not adjacent to any drill site. Statistically significant amounts of 72- and 96-hour immobilization/mortalities of Daphnia placed in reserve pits were demonstrated (not "speculated") during the in situ tests, and chronic effects on growth and reproduction were also demonstrated in two of five diluted drill muds test fluids during the standard laboratory chronic bioassays.

The handling and transport of Daphnia for the Service in situ studies varied considerably from that of the ESE study. Control mortalities at 48 hours and 96 hours were 0-8 percent and 0-2 percent, respectively, depending on test series. The tests were performed without sample replacement. In the ESE study, "controls" were collected in the impoundment at drill site 7, a site already demonstrated to be contaminated in the Woodward studies. Thus, Daphnia already acclimated to toxicants were used for testing. These in situ tests were run for 48 hours only, and 48-hour mortalities of the "controls" ranged from 20-100 percent, indicating unacceptably high mortality rates from handling or transport. The ESE methodology for collection involved straining, transfer involved pouring, and final collection prior to mortality assessments involved straining, and were not comparable to methods used by Woodward et al. The ESE procedures probably exposed test individuals to air, resulting in the capture of air bubbles under the carapace, resulting in anomalous floating behavior and impaired swimming. Various protocols for Daphnia bioassays specify careful procedures to avoid exposure to air, such as pipetting. Whatever the cause, the unacceptably high mortality in ESE controls indicates that information on in situ test methods, data, and interpretation should be deleted from the report. If bioassay data are desired in the report, we recommend new sample collections next summer and use of standard acute and chronic laboratory bioassays to replace the in situ tests. Alternatively, we would be happy to demonstrate the techniques described in Woodward et al. to perform in situ tests and minimize mortalities.

The current study makes an important contribution to our understanding of the effects of reserve pit fluids on vascular vegetation and phytoplankton. Although presence/absence data are interesting, additional summarization of plant numbers by site location would be more useful. For phytoplankton data, numerical counts were very low; additional cell counts would strengthen the data base. More explanation is also needed for the conversion factors in Table 3-9. For vascular

plants, diversity analyses (H') and a quantitative summary of percent cover by site, including ranges and means, are needed. Table 3-12 is confusing and should also be further explained or summarized. (Shouldn't percent live plus percent dead vegetation at each site add to 100 percent?)

There were several inconsistencies in the tables on the concentrations of elements and compounds found in water (Tables 3-14 and 3-15). Chromium concentrations including total, trivalent, and hexavalent chromium were exactly the same for the total and dissolved fractions. The likelihood of this coincidence is small, and the likelihood of all chromium being dissolved chromium is even smaller. Could there have been transposing errors when these tables were prepared? If not, then the the results suggest either that (1) all samples were contaminated with the ACS grade nitric acid containing a consistent concentration of chromium in the two valence states, or (2) dissolved water samples were acidified prior to, rather than following, filtration, or (3) a laboratory reagent or other contaminating source of chromium was present. Note that the concentrations of chromium found in water in this study were an order of magnitude higher than in either Service study, and that chromium was not detected in any of the six control ponds in the two Service studies, even at a detection limit of 0.0005 mg/L.

Other discrepancies in the Table 3-15 involved conductivity versus total dissolved solids and hardness versus the actual concentrations of calcium and magnesium. In Standard Methods (APHA et al. 1985), conversion equations are presented, suggesting that conductivity is related to total dissolved solids by multiplying by a factor that falls between 0.55 - 0.9. All of the concentrations presented in this table are at or above this upper limit. An equation for calculating hardness from Ca and Mg is also presented in Standard Methods. Although one would expect some differences between calculated hardness and hardness based on field titrations, especially where barium and strontium also contribute to hardness, the differences in the table are quite large. We therefore recommend using calculated hardness values and ignoring field titration values.

Clarification is also needed in the report on which control data were used in each table (or when control means are given). For Table 3-18, the unit of measurement presented (mg/L) is incorrect.

The use of the road watering site is confusing. At times, it appears to be treated as a road watering treatment, and at other times as a control. The appropriateness of examining only one road watering site as a treatment should be reconsidered, especially in view of the non-representativeness of this site. To our knowledge, this road is seldom used, so that dust ordinarily generated and transported aerially after watering with reserve pit fluids would be minimal. Also, the volume of road watering is likely to be low in comparison to volumes once received on major road systems. The coastal location of this site, in addition to road watering with reserve pit fluids, would also preclude considering this site as a control site.

The entire thrust of this report, according to the title, is bioaccumulation. However, this subject is addressed very briefly in the text. Discussion should revolve around bioassimilation, as well as bioconcentration, since high concentrations of metals in the environment leading to correspondingly high tissue concentrations is also ecologically and biologically important to organisms. Although a qualitative evaluation of bioconcentration factors (<, >, =), is presented in the text, a table showing actual invertebrate tissue concentrations by sample, by site, and by treatment is needed in the text to evaluate the representativeness, comprehensiveness, and replicability of tissue concentrations in the ESE study. If I was reading Appendix C correctly, only five bioaccumulation samples were obtained for analysis. If this is the case, the small sample size limits the scope of interpretive remarks and generalizations concerning the Prudhoe/Kuparuk oilfields, and additional sampling is warranted.

A final comment concerns the appendices. The presentation of raw data in an unorganized format precludes easy reader review. It would be helpful if records were at least sorted by site and by treatment, and if summary statistics were given.

In conclusion, the ESE draft report should be revised to provide more information and to more adequately compare and contrast findings with other published findings. The section on bioassays should be deleted based on unacceptably high mortalities in the controls. Additional summary tables showing numerical data by site and by treatment are needed in the text, particularly in the community structure, diversity, and bioaccumulation sections, but also in the chemistry section. Discrepancies in the data on the controls south of the oilfield should be resolved, as should data on conductivity and total dissolved solids, hardness, and chromium concentrations. Appendices should also be revised to permit easy review and additional analysis.

Thank you for this opportunity to comment. If there are additional questions concerning our comments, please contact Dr. Snyder-Conn (907-456-0323) in this office.

Sincerely,

Paul E. Gertler
Field Supervisor

cc: Brian Ross, EPA, Anchorage
John Warren, DO&G, Anchorage
Warren Matumeak, NSB, Barrow
Elizabeth Benson, DGC, Fairbanks
Al Ott, ADF&G, Fairbanks
Brad Fristoe, ADEC, Fairbanks
Greg Zimmerman, ADLM, Fairbanks

Question from Senator Wirth

QUESTION: Please provide us with past memos, letters or other relavant materials from the Fish and Wildlife Service regarding environmental problems associated with oil and gas activities in the Kenai National Wildlife Range, including but not limited to oil spills and PCB contamination.

ANSWER: We are providing documents related to the following environmental problems associated with oil and gas activities in the Kenai National Wildlife Refuge:

1. Swanson River Oil Field Polychlorinated Biphenyl Contamination

2. Gas well blowout - Swanson River Field, 1986

3. Beaver Creek Field, underground crude oil leak

4. Oil spills from vehicular accidents

5. Gas well blowout - Beaver Creek Field, 1967.

The documents will include relevant narrative reports/summaries, letters, memorandums, and an Order by Consent/Mitigation Plan.

REFUGE NARRATIVE REPORT

1967

KENAI NATIONAL MOOSE RANGE

Kenai, Alaska

On February 11, the Marathon Beaver Lake # 1 well suffered a gas blowout. The gas blowout occurred as follows:

During normal drilling operations a pump draws drilling mud from an open tank and injects it down the drill stock at 1500 pounds per square inch pressure. The mud leaves the drill stock from the orifice in the drill head at the bottom of the stock and returns to the surface through the annulus carrying cuttings to the shale shaker, then flows into the mud tank.

The first indication of trouble below occurred at the 9070' level when the mud tank began filling; obviously the quantity of mud in the drill stock and annulus was decreasing.

A person whose duty it is to maintain surveillance of the mud-tank level gave the alarm and the line from the annulus was diverted from the shale shaker to the drill stock, drilling was stopped and both blowout preventors were closed, thereby stopping circulation, pressurizing the system, and permitting an increase in mud volume down the hole.

At that time they were using 13.9 pounds per gallon mud; the normal weight for Kenai operations is 10.8 pounds per gallon.

They soon had all hands breaking mud bags and adding mud to the mix.

When back pressure in the annulus reached 600 p.s.i., they decided to inject what mud they had mixed --600 barrels. While this was being injected, gas and mud began appearing in the cellar--indicating a gas escape between the formation and the casing cement, although the casing was cemented to the 2,000' level.

At this development some of the crew left the pad; the boilers, drilling diesels and other equipment were shut off; only the mud injection pump and light plant remained running.

Gas began collecting in the top of the annulus and was periodically bled off through the first pressure reliever. The pressure relievers are high pressure fittings below the first blowout preventer.

When a fitting on the first pressure reliever exploded all of the mud within the annulus was ejected through the 2½" pipe on the pressure reliever in a very short time. It was this event that prompted the complete evacuation of the pad.

Later the other pressure reliever blew off and dry gas mixed with pulverized sand ejected from both openings at a pressure in excess of 5,000 pounds p.s.i.

The well blew out of control for 11 days and was finally sealed off by natural bridging. During the blowout, high velocity gas eroded the well walls and produced a large volume of sand and silt material. This material accumulated to a depth of 20 feet at the pad site and in the forest within 3/4 mile of the well formation material accumulated to several inches in thickness. A $\frac{1}{4}$ inch fall of this material accumulated on Beaver Creek, which was frozen at the time. Most of this material was carried downstream by overflow water. Salmon and trout spawning beds did not appear to be damaged; however final checks of the possible damage of this has not been completed.

If the blowout had been wet gas or oil the effects would have been much more serious.

Cleanup of formation material and the well pad has been partially completed by Marathon Oil Company at a cost of $48,000.

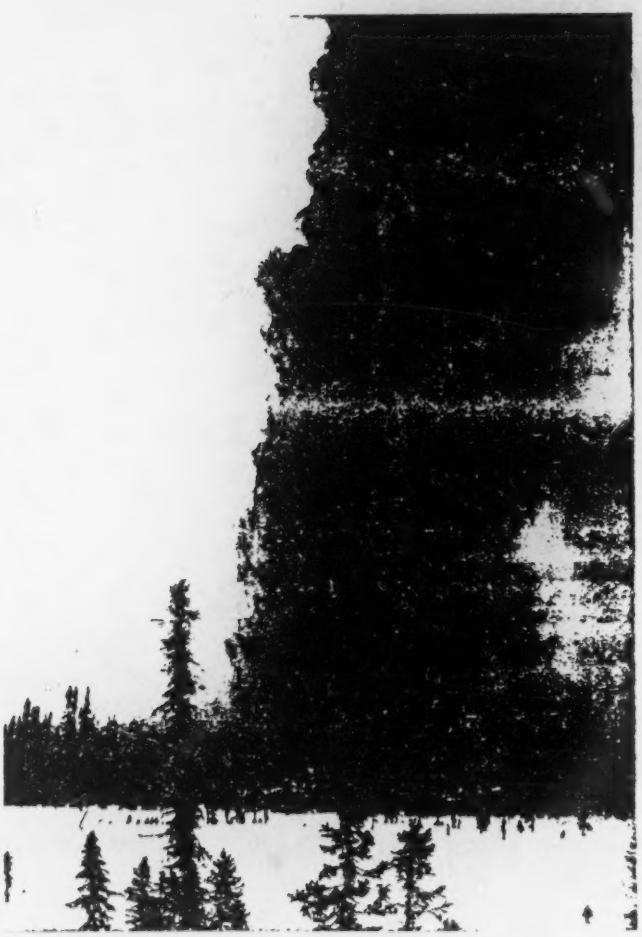
The Marathon Company constructed another well pad (Beaver Creek #1A) approximately 1 mile from the blowing well and began slant drilling operations intending to intersect the blowing well and seal it with cement. When the blowing well bridged and was successfully shut in from the surface, the slant drilling at site # 1A was suspended and vertical drilling commensed. A commercial quantity of gas was discovered there.

In June a development well (Beaver Creek # 2) was begun on the east side of Beaver Creek. This well also developed commercial quantities of gas. These three well pads required the construction of 8 miles of road, two gravel pits and two log-bridges on the Moose Range. The access to this road is near the town of Kenai. These increasing number of access routes continues to complicate management of this area.

The Texaco Oil Company constructed a 25-mile winter road (ten miles in the Moose Range) to an exploratory well site near Lark Lake. Drilling complications resulted in operations extending into early summer requiring their construction of a 4300 x 200 airstrip to provide access for supplies and heavy blow out and well-fire equipment. The well drilled at this site proved unproductive. The company is currently drilling another exploratory well 2½ miles southeast of the above site.

Seismographic

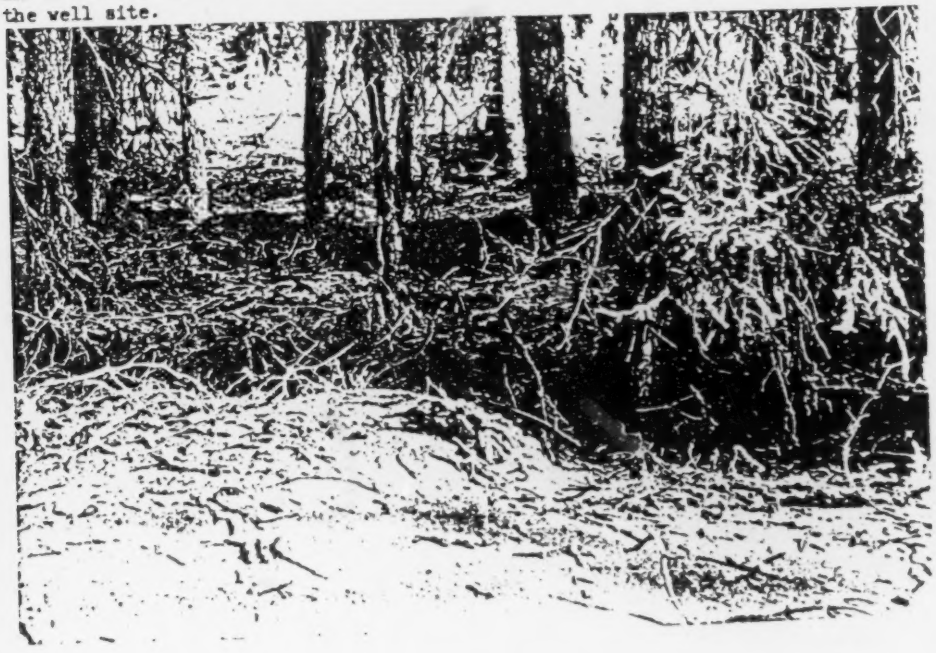
Presently the following oil companies are involved with seismographic activities on the Moose Range.

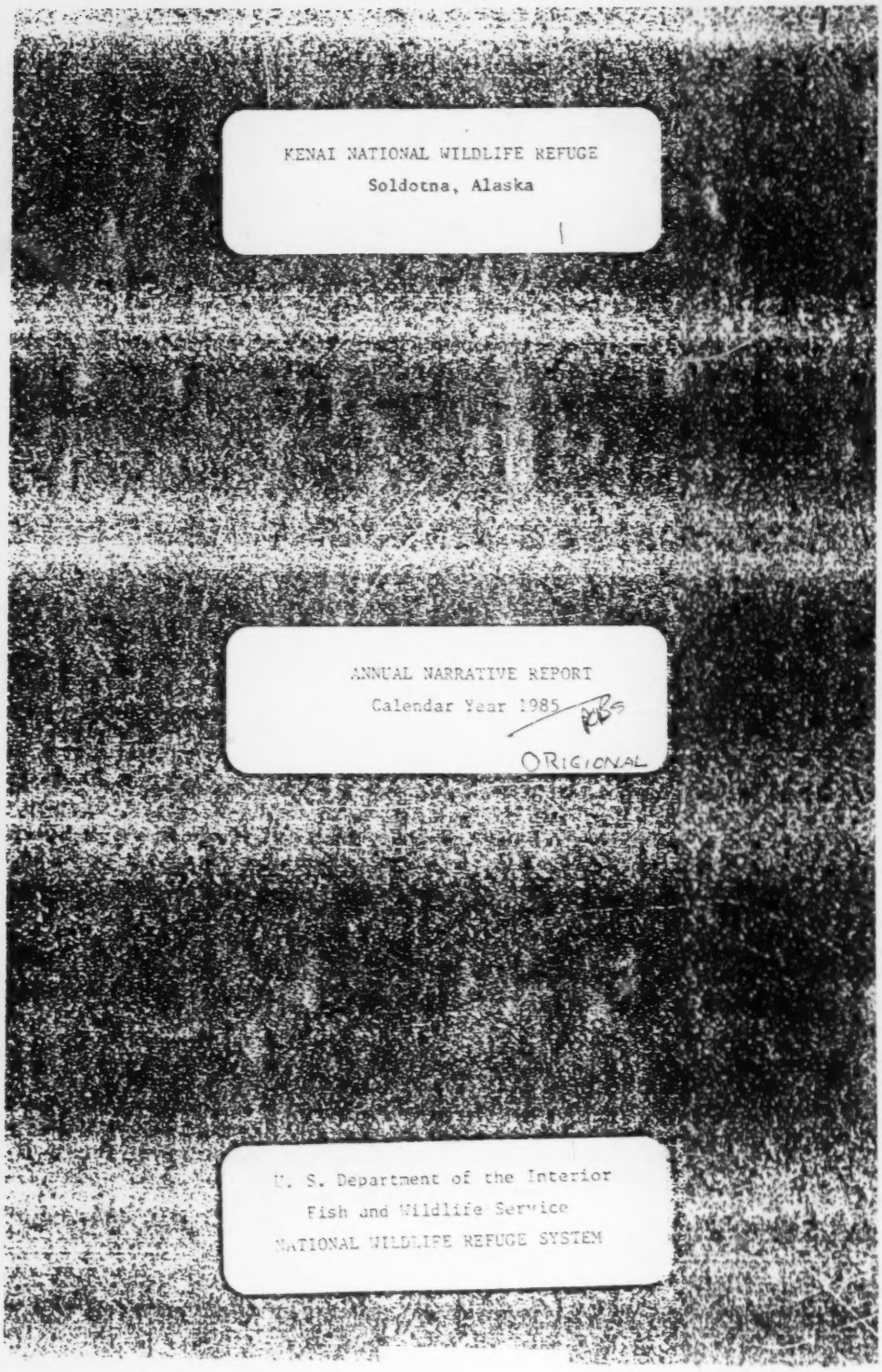


2A-61 This gas blowout occurred at the Beaver Creek well, sending rocks and silt 500 feet into the air and badly silting Beaver Creek. This is a hazard of oil operation.

2A-44 The gas blowout at Beaver Creek badly silted this excellent salmon and trout stream. Luckily most of the stream was frozen and much of the silt was washed out over the ice. Some permanent damage probably occurred.

2A-41 The entire forest area was heavily silted for a $\frac{1}{4}$ mile radius from the well site.




KENAI NATIONAL WILDLIFE REFUGE
Soldotna, Alaska
ANNUAL NARRATIVE REPORT
Calendar Year 1985
ORIGINAL
U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

J. OTHER ITEMS

2. Other Economic Uses

a. Oil and Gas

1. Beaver Creek Field - For the third consecutive year, no drilling operations were conducted. In October, Marathon Oil Company, completed a $200,000 30'x100' office/shop building complex communications and monitoring instruments, quarters for the daily shift operators, and general shop activities.

Marathon, looking ahead to the usual problems of spring breakup, installed a dozen new road culverts and transported substantial gravel to their access road. Some public gravel/sand was used from Kenai Native Association lands.

Cumulative production through August 31, 1985 was:

3,134,480 barrels of oil
1,271,748 MCF of solution gas
25,139,110 MCF of gas well gas

Production for the period from September 1, 1984, through August 31, 1985, was:

154,171 barrels of oil
103,151 MCF of solution gas
9,568,963 MCF of gas well gas

Production for the month of August 1985 was:

13,383 barrels of oil
6,502 MCF of solution gas
634,772 MCF of gas well gas

2) Swanson River Oil Field (SRF) - No new wells were drilled during 1985.

Soil samples taken from the Swanson River Oilfield by FWS personnel in 1984 revealed the presence of PCB's and DDT. Further tests, conducted by Chevron and the EPA, verified the extent and concentration of these highly toxic environmental contaminants. The contaminated soil is believed to be the result of an industrial accident 14 years ago, which contaminated the snow and was later mixed with soil. This soil, not known to contain contaminants, was later used on certain roads as a means of dust control. Only in later years was the contaminant found to contain a suspected carcingen PCB. The believed contaminate, a liquid recommended and utilized at the time of the accident in support of production operations at the Field, was found to contain, some years later, a suspected carcinogen (PCB).

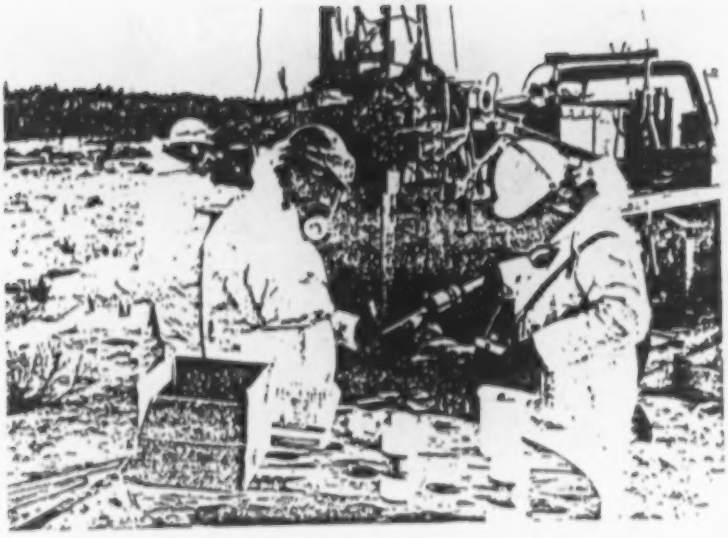
The Order-By-Consent, Mitigation Plan - Swanson River Oil Field, Kenai National Refuge, was signed August 6, 1985 by Chevron U.S.A., Inc., specifying the time to comply with the clean-up schedule. Chevron provided security at the SCU 14-3 site; as well as a description of operations within the Field; identified spills of hazardous substances; including an inventory of any item that contains PCB fluids or materials; and listed petroleum compounds and hazardous substances other than PCBs used at this facility. Chevron contracted Ecology and Environment, Inc. of San Francisco, CA., to develop the required Interim Mitigation Plan which was completed September 5. This plan's primary objectives include containing areas known to have PCBs and prevent contaminants from migrating into the soil or underground. An initial Sampling Plan identified areas for remedial action and assessed impacts of contaminants on fish and wildlife. An Analytical Plan to provide data from samples collected from the Swanson River Field was submitted. The data generated from the sampling and analysis program will be used for risk assessment and to delineate areas requiring eventual mitigation. The Mitigation Plan and Sampling Plan were approved while the Analytical Plan provides for soil samples to begin October 15. According to the Mitigation Plan, the SCU 14-3 stockpile was covered.

Under Phase I of the Sampling Plan, Ecology and Environment, Inc., Chevron's contractor for the PCB clean-up, began collecting more than 2,000 soil samples from selected areas within the field in October. Biological and water samples were also collected and four monitoring wells drilled. Approximately 2,000 samples were collected, but the limited spiked samples received permitted only 150 soil samples to be shipped to the lab for analysis.

An additional 220 soil samples were shipped in December to Analytical Technologies for PCB and heavy metal analysis.

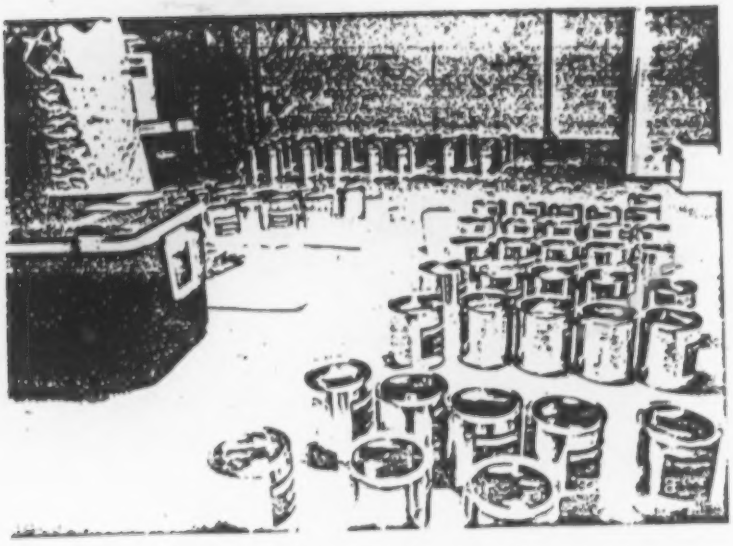
Soils were collected from varying depths throughout the Field under Chrvron's Order by Consent. RAR

Contracting crew collecting soil sample and checking for aromatics along a Swanson River Oil Field Road. RAR

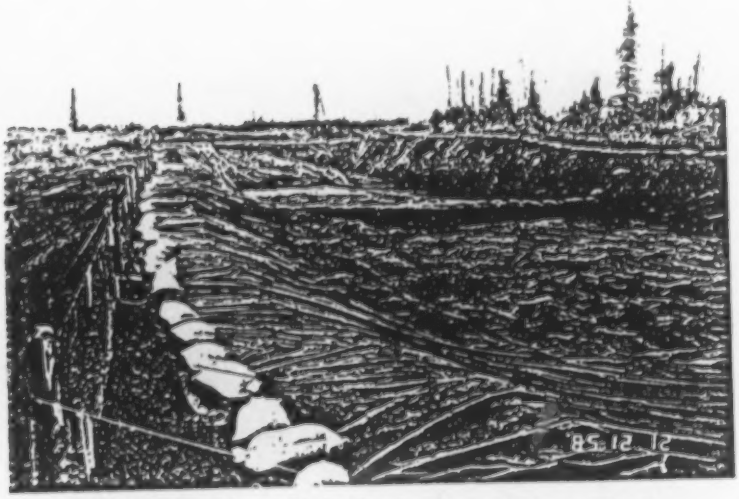


Over 1000 soil samples were collected in the Swanson River Oil Field under Chevron's Order by Consent. RAK

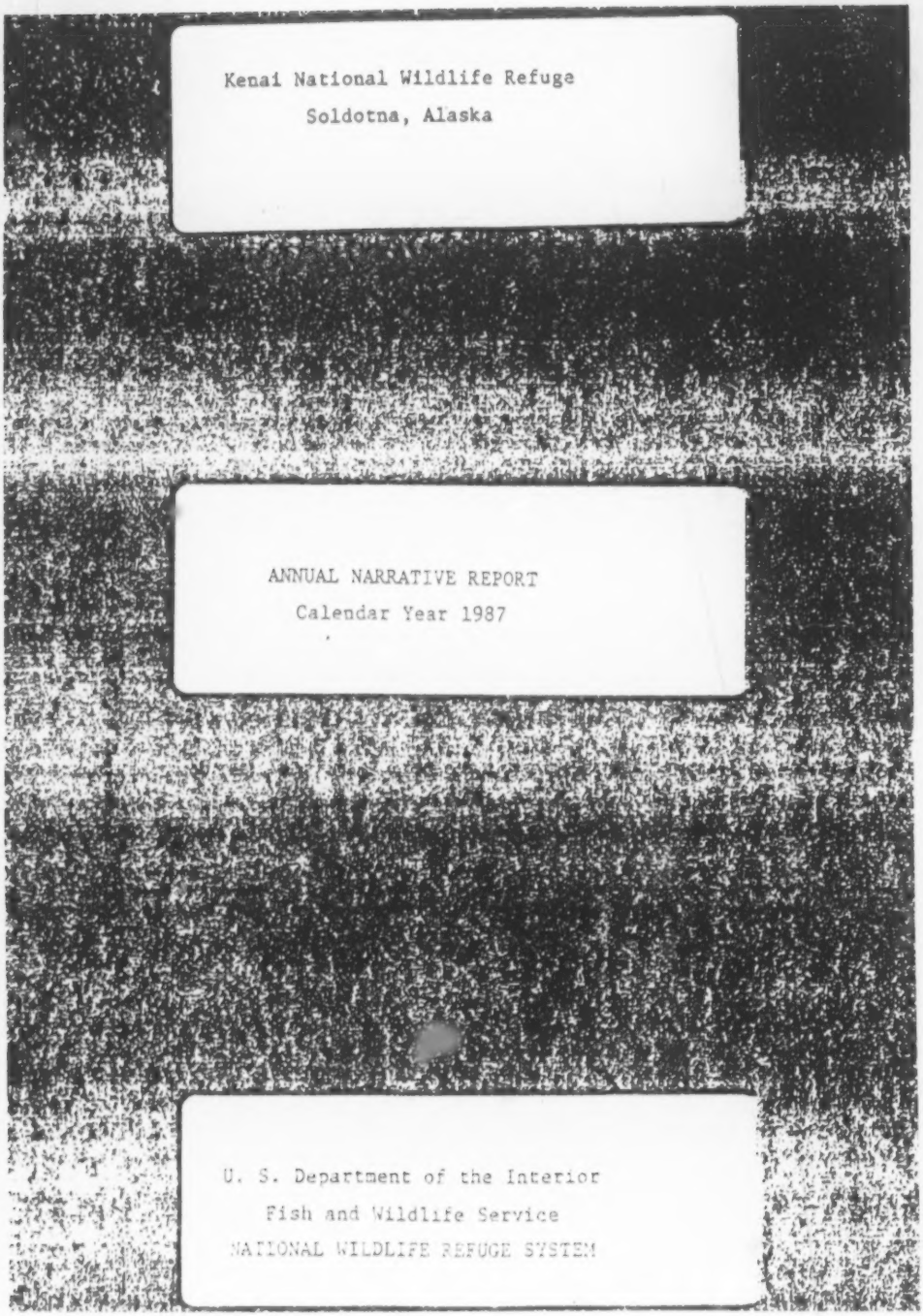
Crews checking for aromatics from soil sample collected at one of five monitoring well sites drilled within the Swanson River Field. RAK



Each soil sample collected from the Swanson River Field required special handling for shipment for lab analysis. RAR



The Swanson River Field 14-3 site was covered to contain and secure contents and prevent wildlife contact. RAR


Kenai National Wildlife Refuge
Soldotna, Alaska
ANNUAL NARRATIVE REPORT
Calendar Year 1987
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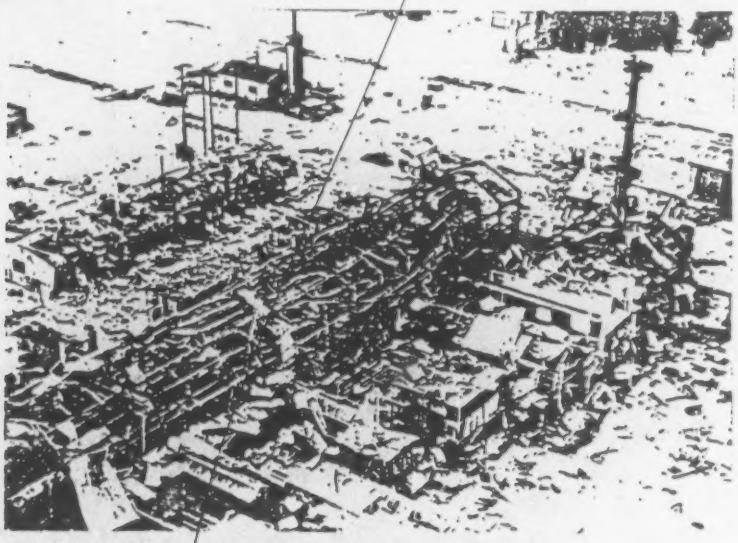
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

barrels/day (6100 barrels/day in December), and cumulative production through December 31 was 207,309,141 barrels. This cumulative total represents a recovery of nearly forty-six percent of the estimated barrels of original oil in place.

Following the minor gas blowout at well Soldotna Creek Unit 11-16 in December 1986, cleanup continued at the adjacent 3-9 Tank Setting/drilling pad. Produced subsurface material and pad soiled gravels were trucked to the approved Field solid waste facility. A workover rig was engaged to plug and abandon three of the four wells located on this well pad.

Without doubt, the most time consuming project for the staff was the continuation of the polychlorinated biphenyl remediation project. American Toxic Disposal of Illinois, ARCO's original contractor for the project, engaged SRH Incorporated as a subcontractor responsible for the excavation of contaminated soils from localized roads and parking areas within the Field.



This is where it all happened January 26, 1972. A natural gas explosion at this plant facility sprayed Therminol containing polychlorinated biphenyl over the snow covered area. RR

Kenai National Wildlife Refuge
Soldotna, Alaska

12/86
SRF 11-16
Blow Out

ANNUAL NARRATIVE REPORT
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U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

The decrease in diesel fuel (47.4%) reflects reduced hours in snowplowing in 1986, and somewhat less time on campground road grading. Considerably more road work (gravel hauling, ditch pulling/shaping) took place in 1985 than in 1986.

J. OTHER ITEMS

2. Other Economic Uses

a. Oil and Gas:

1. Beaver Creek Oil/Gas Field (BCF) - Other than wireline work over wells 1A and 5RD, no new wells were drilled for the forth consecutive year. Deliverability and pressure tests were conducted on the four Sterling gas wells, 1A, 3, 6, and 7. Average pressure of the Sterling Reservoir was calculated to be 1909 psi. The Sterling Gas monitor well #2 remains shut-in.

The BCF's six (6) producing wells include, four natural gas and two crude. Average daily crude production remained at 432 bbl/da. while gas was about 48,500 MCF/da.

Cumulative production through December 31, 1986 was:

3,335,694 barrels of crude (wells 4 and 5RD)
47,450,667 MCF dry gas (wells 1A, 3, 6, 7)

Natural gas produced is transported to the Alaska Pipeline Company transportation facilities for subscriber use in the Anchorage area. Produced crude is trucked about four times a week from Field storage tanks into 200 bbl tankers and transported to North Kenai refineries or sales.

2. Swanson River Oil Field (SRF) - Following nearly thirty years as Operator of the Swanson River Field, the oil field that paved the way for Alaska statehood, Chevron USA, Inc. on October 1, 1986, relinquished operating control of the Field to ARCO Alaska, Inc., as part of a nationwide reorganization forced by declining oil prices.

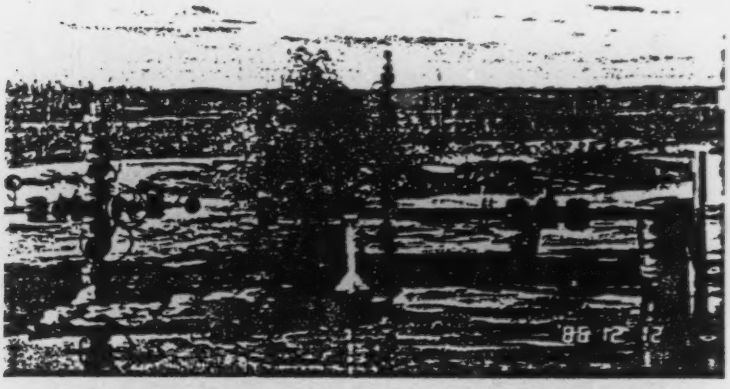
Swanson River Field's discovery in 1957 was the first commercial oil find on the Kenai Peninsula. The discovery provided a source of revenue for Alaska, helping convince Congress the territory had an economic base capable of supporting statehood. The Field is small by contemporary Alaska standards, but with more than 205 million barrels produced, it ranks as the forth most productive in state history.

(a) Field Operations - Field production is maintained by formation pressures averaging nearly 4800 gpsi. A large compressor facility of 17 gas fired compressor units provides the necessary 38,000 H.P. to attain the 6,000 gpsi pressures required by nine strategically located injection wells. Average daily gas injection was 255,444 MCF/da.

During the year approximately thirty-two crude wells were under production at any time. Daily production averaged 5488 bbls/da; cumulative production through December 31, 1986 was, 205,271,026 barrels of crude. This cumulative total represents a recovery of forty-five percent of the estimated barrels of original oil in place.

Although remedial work was conducted on several wells within the Field, no new wells were drilled during the period. Shut-in well status was reviewed, certain wells reworked, and some wells returned to production. Nine wells were listed under temporarily abandoned status because of high gas to oil ratios, the others classified as uneconomical. Twelve wells were identified for possible abandonment pending an analysis of each. Wells abandoned will require restoration of all disturbed lands and possible surface gravel recovery for use as future needs require.

December 12, the refuge was notified by ARCO of a gas blow out at a well location (SCU 44-8) within the Field. ARCO immediately moved well blow out specialists and supporting equipment and personnel to the scene to address the real possibility of this becoming a very serious event.

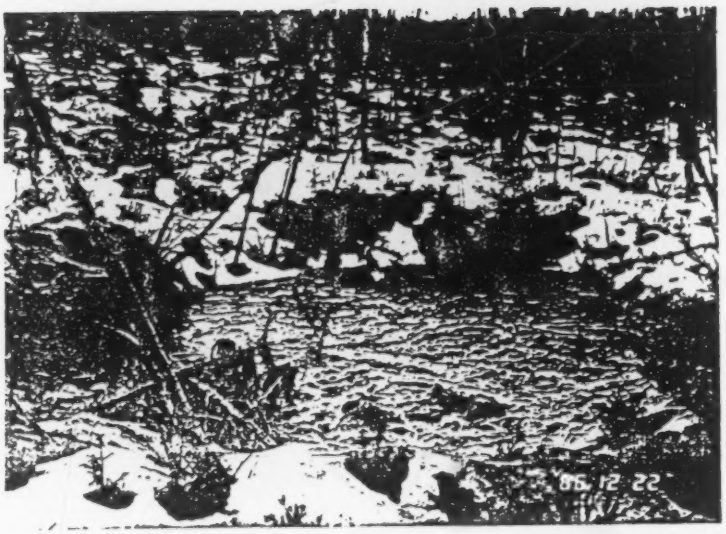


A minor gas blow out within the Swanson River Field December 12, provided some anxious moments during the two weeks before problem well SCU 11-16 was arrested. RR

Fortunately, following two weeks of escaping gas at the well site and at gas seeps adjacent to and within the Swanson River 1/4 mile north, the problem well, then identified as SCU 11-16 adjacent to well SCU 44-8, was

"killed" early Christmas Day. Apparently, production tubing near the surface had ruptured permitting gas to enter the surrounding casing annulus and bypass the casing shoe downhole eventually reaching the surface at several locations.

The gas blow out first surfaced from the cellar of well SCU 44-8, depositing subsurface sands, produced water, and some crude around the well pad. RR.



Escaping gas also produced water from surface aquifers removing and displacing local soils down gradient to leave some excavations six feet deep. RR.

(b) Polychlorinated biphenyls (PCB's) - The final shipments of soil samples collected within the Swanson River Field following the finding of Polychlorinated biphenyls (PCB's) within the Field in July 1984, were air freighted in January for analysis by Analytical Technologies, Inc. of San Diego, CA. More than 1,100 soil, water, and biological samples were collected and forwarded to specific labs for analysis.

On May 21, with all agencies signatory to the Order by Consent of April 6, 1985 in attendance (FWS, BLM, ADEC, USEPA, Chevron, and their contractor Ecology and Environment, Inc.), a meeting was held to discuss Chevron's Risk Assessment document conclusions and approve PCB cleanup standards for the Swanson River Field. This meeting, however, adjourned with no agreement on the cleanup standards. The assessment it was determined, required an expanded and much more detailed literature review with regard to recent data on wildlife and biological communities.

On July 2, the proposed Mitigation and Restoration Plan document to all signatory agencies was received. Agency representatives on August 15 again met at Anchorage to discuss and finalize Chevron's Restoration Plan for the cleanup of PCB's. The soil cleanup levels established required

ARCO ALASKA, INC.

DISCHARGE REPORT

LOCATION OF DISCHARGE:	~~Well #44-A-8~~ Scall-16 ~~26~~ At 713 Ft. from the south line, 736 Ft. from the west line of Section #9 T 7 N, R 9 W, S.M.
TIME OBSERVED:	December 12, 1986 ✓ 0700 AM
REPORTED BY:	Dal Burford, ARCO
TO:	Bob Richey U. S. Fish & Wildlife, Soldotna
RESPONSIBLE GROUP:	ARCO Alaska, Inc. P. O. Box 100360 Anchorage, Alaska 99510-0360
TYPE AND AMOUNT:	Primarily gas, less than 3 MMSCF/D. At approximately 10:30 AM on December 15, 1986, an estimated amount between 5 and 20 bbls. of crude oil was observed in the pit close to well #44-A-8. No additional hydrocarbon liquid has been detected but it is possible that a small amount of additional crude has reached the pad since initially detected. The total amount of liquid hydrocarbon that has reached the surface is unknown. However, all produced liquid hydrocarbon has been contained on the pad.
CAUSE OF DISCHARGE:	Well failure allowed hydrocarbon gas to to the surface in the area of 44-A-8. It is our opinion that the source of the gas is well #11-16.
ENVIRONMENTAL DAMAGE:	None. Hydrocarbon liquids have been on the gravel pad in immediate area of well #44-A-8. Gas has released to the atomosphere and, although this presents some safety concern, it has not caused observable environmental or human health impact.

FCB 1 0 1987
SOLDOTNA ALASKA
FISH AND WILDLIFE SERVICE

February 13, 1987

Mr. Mike Lucky
Alaska Department of Environmental Conservation
P. O. Box 1207
Soldotna, Alaska 99669

Re: Swanson Gas Flow, Well 11-16

Dear Mr. Lucky: Mike

Thank you for your letter of January 26, 1987, and your continued interest to insure that the clean up for the well proceeds smoothly and in accordance with existing regulations. As discussed and confirmed during Mr. Henry Friedman's field visit on February 4, 1987, the site clean up is proceeding smoothly. At this time most of the oil contaminated gravel has been removed from the pad and other phases of site restoration are either underway or will be initiated shortly. Your letter requested specific information on three aspects of the site. The following provides information to address your questions.

1. Gas leaks to the surface in the site area.

During the gas flow the majority of the gas flowing from Well 11-16 reached the surface in the immediate area of Well 44-A-8. Approximately three days after the gas flow was detected, additional minor and moderate flows were detected in the area to the northeast of Tank Setting (TS) 3-9. The closest vent to the northeast, as shown on the attached map, is approximately 250 feet north of the access road. The actual number of releases was not determined and the best description of the number of vents is "dozens" of small sites and three larger sites. The three larger sites were also located in the same area to the north east of the pad. In addition to the vents to the north there were "several" small gas vent sites to the south of the pad.

Both vent areas were detected when the gas flow was continuing.

In order to address safety concerns and determine if any oil was reaching the surface, the locations were inspected approximately every two hours. After Well 11-16 was killed, the gas flow, on the pad and in both areas off the pad, subsided rapidly. During our February 4, 1987, site visit with Mr. Friedman and Mr. Richie only one site was found that shows a continuing small gas release to the surface. The amount or rate of flow was not estimated but can be described as very small.

At this time ARCO personnel are continuing to monitor the areas daily and will continue to look for any liquid hydrocarbon. The gas vents are, as expected, continuing to decline. It is probable that all flow to the surface will cease in the next couple of weeks. The only area where liquid hydrocarbon reached the surface was on the pad and all of that liquid was contained on the pad. Should liquid be detected elsewhere, I will notify ADEC and others in compliance with the established spill reporting procedures.

2. Oil spill clean up.

As discussed during our January 9, 1987, telephone conversation, prior to site clean up it was necessary that ARCO determine the physical condition of the pad and soil under the site before moving equipment on to the pad. The engineering review was completed on January 26, 1987, and we began clean up of the site, including removal of contaminated soil, on January 29, 1987. When I visited the site on February 4, 1987, the majority of the contaminated soil had been removed by excavating a pit around Well 44-A-8. We have excavated the soil from around the well and scraped the pad to remove the hydrocarbon contaminated soil. The soil is being trucked to the Central Disposal site and being disposed of in accordance with Solid Waste permit number 8623-BA0004. If weather conditions allow, the initial clean up of the site should be completed on or before March 15, 1987. There is, however, ice and frozen snow on areas of the pad that will likely prevent complete site clean up. It is currently planned to conduct site inspection and final clean up of all residual hydrocarbon this Spring, 1987.

The Spring, 1987, clean up date is also optimum because we will be using a drilling rig to plug and abandon Well 11-16 beginning in March or April, 1987. The rig activity, and other actions that may be needed to abandon two other wells (14-A-9 and 44-A-8) is scheduled to be moved to the site in mid-March. This work will be completed this Spring and final clean up of the hydrocarbons from Well 11-16 in late Spring, will allow clean up of the pad after all work over, plugging, or abandonment action on the pad has been conducted.

3. Subsurface assessment

Because Well 11-16 is essentially a gas well (last gas/oil ratio was approximately 40,000 scf/B), we believe the only oil produced during the blowout was limited to the hydrocarbon liquid that had been placed in the tubing when the well was shut-in. We believe that all of the released liquids were produced to the surface in the area of 44-A-8. However, there is some potential that minor hydrocarbon contamination, may remain in the ground under the pad or in the immediate area of the pad.

In order to confirm the presence or absence of any contamination, we will take a sample in mid February of the ground water from the water well which is located on the southern end of the TS 3-9 pad. This sample will provide an initial indication of the presence of hydrocarbons. We will also be collecting additional samples from other water wells on additional pads close to TS 3-9 in March. The March samples will be taken by the same contractor that will be conducting sampling at the Central Disposal site.

It is too early to predict what will be done after these samples are analyzed. As additional information becomes available on the condition of the ground water, I will forward that material for your review.

Again, thank you for your continued interest and assistance. If you have a question about this letter or if I can provide other information about ARCO's activities in the area, please call me at 265-6176.

Sincerely,

P. N. Hellstrom

Peter N. Hellstrom
Senior Environmental Coordinator

PNH/rmm:002

cc: Bruce Erickson, ADEC
Bob Richter, U.S. Fish and Wildlife
John Catlin, BLM

2. Other Economic Uses

a. Oil and Gas

(1) Beaver Creek Oil/Gas Field

Marathon Oil Company, operator of the Beaver Creek Oil and Gas Field, completed the construction of a new underground water-gathering system between several producing wells. This system collects formation waters produced during the production of oil and gas within the field, and transports the waters for reinjection at the Beaver Creek Number 2 Disposal Well. A potable-water pipeline was also installed from the Beaver Creek Number 3 Pad to the office complex adjacent the Beaver Creek Number 4 Well Pad.

In early September, crude-soiled gravels were discovered surrounding a shipping pump between the 1000- and 5000-barrel holding tanks within the Beaver Creek Oil and Gas Field Tank Farm. Soil borings were immediately taken to delineate the extent of the problem; however, the underground leak situation had, apparently, been occurring for several years. Early information suggested that the contaminated soils extended beneath the tank settings and would require their removal for a proper cleanup.

On September 25, cleanup efforts were set back when a recycling hose, attached to the 1000-gallon tank, disconnected from a flange, causing a 145-barrel spill. Fourty-five barrels were immediately recovered as liquids, however, 100 barrels seeped into the surrounding soils to be excavated.

Following the displacement of both tanks, and excavation of about 3200 cubic yards of soil, it was apparent that the original spill would develop into a major cleanup undertaking. Subsequently, a new tank farm location was constructed within the existing Beaver Creek Number Four Well Pad Area and the two displaced tanks with associated piping were relocated to that site. Preliminary testing of samples taken by the Department of Environmental Conservation, on October 1, did not reveal any toxic substances above a very low concentration level.

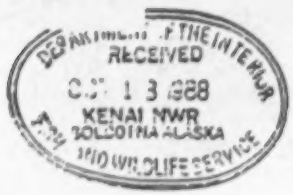
Representatives from Marathon Oil, and the Bureau of Land Management, as well as the Beaver Creek Oil/Gas Field Operator, the Fish and Wildlife Contaminant Coordinator, the Refuge Contaminant Coordinator, and members of the refuge staff, met at the Headquarters, November 7, to discuss the current status and future program for cleanup of a chronic spill at the Beaver Creek Field Tank Farm. Final crude-spill cleanup of the now-frozen area was terminated for the season. More than 3200 cubic yards of contaminated material, removed from the tank farm spill site,

Alaska R n
Domestic . oduction

Marathon Oil Company

O. Box 190168
nchorage, Alaska 99519
lephone 907/561-5311

Mtg 11/7/8
1400 Meeting



COPY

October 14, 1988

Mr. Paul Horwath
Alaska Department of Environmental Conservation
P. O. Box 1207
Soldotna, AK 99669

Re: Beaver Creek Facility Crude Oil Spill of September 25, 1988

Dear Mr. Horwath:

In response to your letter of October 7, 1988, Marathon Oil Company herein submits a cleanup plan for the oil spill which occurred September 25, 1988 at Beaver Creek. Included in this plan is the information you requested in your letter. The Plan was designed to address not only the September 25, 1988 spill but also contamination associated with previous leakage from the shipping pump and other possible releases which may be encountered during cleanup activities.

This Plan was developed during excavation of the pad and as information on the extent of contamination became available. At a meeting on October 12, 1988 attended by representatives of ADEC, BLM, USFWS, Harley's Trucking and Marathon Oil Company, the approach presented here was discussed and generally agreed to.

We would appreciate your timely review and written approval to proceed. If you have questions or need additional information, please do not hesitate to call.

Sincerely,

T. R. Brooks

ROBERT G. ELDER, Ph.D.
Environmental & Safety Representative

cas:ES16:50

xc: Bob Richey - USFWS
Joe Dygas - BLM
Doug Lockwood - ADEC - Soldotna
T. R. Brooks
J. B. Rodgers
G. A. Newberry

Monthly Activity Report - Kenai NWR
Sept 88

J. OTHER ITEMS

A 145-barrel oilspill occurred at the Beaver Creek Oil/Gas Field (storage-tank site across the road from pad #4) on 25 September. On 8 September, a small spill resulting from a leaky shipping pump (situated between two fuel tanks; one 1000-gallon and one 5000-gallon) was detected. On 25 September, clean-up efforts were set back when a recycling hose, attached to the 1000-gallon tank, disconnected from a flange, causing the 145-barrel spill. Fourty-five barrels were immediately recovered as liquids, however, 100 barrels seeped into the ground. Preliminary testing of samples taken by the Department of Environmental Conservation, on 1 October, did not reveal any toxic substances above a very low concentration level. By 30 September, half of the contaminated area was excavated and ready for backfilling. Clean-up of the remaining portion will proceed immediately after the excavated area is backfilled.

Monthly Activity Report - Kenai NWR

OCT. 88

J. OTHER ITEMS

In early September, crude soiled gravels were discovered surrounding a shipping pump between the 1000 bbl and 5000 bbl holding tanks within the Beaver Creek Oil and Gas Field tank farm. Soil borings were immediately taken to delineate the extent of the problem, however, the underground leak situation may have been ongoing for several years? Early information suggested the contaminated soils extended beneath the tank settings and would require their removal for a proper cleanup.

Following the displacement of both tanks and excavation of about 3200 cubic yards of soil, it was apparent that the original spill would possibly develop into a major cleanup undertaking. Subsequently, a new tank farm location was constructed and the two tanks with associated piping will be moved to that site.

A temporary storage facility was constructed to contain the contaminated soils. Plans to process these gravels include use in asphalt production, incineration of hydrocarbons to produce clean gravels for backfilling the original excavation site, and final entombment within a, yet to be approved and constructed, nonhazardous solid waste facility within the Field.

The excavation of visible crude contaminated soils will continue, awaiting analysis of collected soil and water samples. Marathon Oil Company, the Field Operator, will, upon receipt of complete analysis results, develop a mitigation work plan for review by the involved agencies.

Nov. '88 Monthly Activity Report - Kenai NWR

Representatives from Marathon Oil, and the Bureau of Land Management, as well as the Beaver Creek Oil/Gas Field Operator, the Fish and Wildlife Contaminant Coordinator, the Refuge Contaminant Coordinator, and members of the refuge staff, met November 7, at the Headquarters, to discuss the current status and future program for cleanup of a chronic spill at the Field Tank Farm. Final crude spill cleanup of the now frozen area has been terminated for this season. More than 3200 cubic yards of contaminated material removed from the tank farm spill site are now temporarily stockpiled within a lined and bermed holding facility at the No. 7 well pad. The original holding tanks have been moved to a newly constructed, lined and bermed facility within the No. 4 well pad. Final results of contaminated soil and water analysis, accompanying a plan for the remaining cleanup, has not been received for agency review and approval.

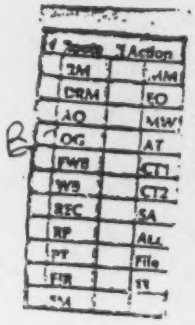
An accident, November 7, involving two large trucks at the mile 9 bridge, Beaver Creek Field, resulted in the spill of crankcase oil from one vehicle, and about 50 gallons of diesel fuel from the other. Apparently, the inbound driver, traveling too fast for the icy road conditions, was unable to stop before striking another almost stopped vacuum truck leaving the one-way bridge. The spills were timely and satisfactorily cleaned up.

Domestic Production

Marathon Oil Company

P.O. Box 190168
Anchorage, Alaska 99519
Telephone 907/561-5311

DEPARTMENT OF THE INTERIOR
RECEIVED
AUG 1 3 1988
KENAI NWR
SOLDOTNA ALASKA
FISH AND WILDLIFE SERVICE



August 12, 1988

Mr. Robert Richey
U.S. Fish & Wildlife Service
P. O. Box 2139
Soldotna, AK 99669

Dear Bob:

In response to our telephone conversation yesterday, I am enclosing a copy of the June 26, 1988 Beaver Creek Oil Spill report to ADEC. I apologize for not providing written notification to you earlier but, as we discussed yesterday, will do so as soon as possible in the future. If you have any questions or need additional information, please do not hesitate to call.

Sincerely,

Bob

ROBERT G. ELDER, Ph.D.
Environmental Representative

cas:ES15:20

Enclosure

Alaska Region
Domestic Production

Marathon Oil Company

P.O. Box 190168
Anchorage, Alaska 99519
Telephone 907/561-5311

August 8, 1988

Mr. Les Leatherberry
Alaska Department of Environmental Conservation
Box 1207
Soldotna, AK 99669

Re: Final Report on June 26, 1988 Beaver Creek Oil Spill

Dear Mr. Leatherberry:

On June 26, 1988 a dump valve on a heater-treater at Marathon Oil Company's Beaver Creek field stuck in the open position. Approximately 4 barrels of fluid, 2 barrels of which were oil, escaped onto the gravel pad and into vegetation adjacent to the pad. The spill was contained by turning off the dump valve, applying sorbent pads and berming off the spill area. Contaminated soil and gravel was removed and placed in double-lined drilling mud boxes which will be stored at Beaver Creek until future disposal options can be determined. The dump valve which malfunctioned was immediately replaced. Environmental damage was limited to the oiling of approximately 20 square feet of soil occupied by small trees and grass.

Sincerely,

Robert G. Elder

ROBERT G. ELDER, Ph.D
Environmental Representative

cas:ES15:27

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

REPLY REFER TO

ORDER BY CONSENT
MITIGATION PLAN - SWANSON RIVER OIL FIELD
KENAI NATIONAL WILDLIFE REFUGE

Chevron USA Inc., Swanson River Field Unit Operator, here and after referred to as the Respondent, hereby agrees to fully comply with and execute this ORDER BY CONSENT.

The U.S. Fish and Wildlife Service will administer this ORDER in coordination with the Bureau of Land Management and the Alaska Department of Environmental Conservation, and in consultation with the Environmental Protection Agency, pursuant to:

1. Pertinent regulations of the United States Fish and Wildlife Service (FWS) and Bureau of Land Management (BLM) (43 CFR parts 3100 through 3160), the Unit Agreement for the Development and Operation of the Swanson River Unit Area No. 14-08-001-2969 (1956), lease terms and conditions, Special Use Permits, and the authorities thereunder;

2. State of Alaska Department of Environmental Conservation (ADEC), Alaska Administrative Code (AAC), 18 AAC 75.010(a), and the Alaska Statutes AS 46.03.100, AS 46.03.302, AS 46.03.710, AS 46.03.740, and AS 46.03.850;

3. Public Law 96-487 Alaska National Interest Lands Conservation Act (ANILCA) Title III - National Wildlife Refuge System, Section 303(4)(A)(B) and Title VII - National Wilderness Preservation System, Section 702(7);

4. Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA);

5. Federal Water Pollution Control Act (FWPCA), as amended; and

6. All other applicable State and Federal laws.

FINDINGS

1. The Respondent operates the Swanson River Field, an oil and gas production facility on Federal leases in the Kenai National Wildlife Refuge (Kenai NWR), Alaska. The BLM issues the oil and gas leases and regulates drilling and production operations. Use, conservation, and protection of the land, and environmental and biological resources within the Kenai NWR are under the jurisdiction of the FWS.

2. The facility (covering approximately 14 square miles) consists of an administration office and shop buildings, water wells, a compressor complex, storage sites, airfield, producing oil wells, gas injection facilities, oil collection and transferral facilities to pipelines, family residences and approximately 25 miles of unpaved roads.

3. Public vehicular entry to the Swanson River Field is restricted but public access by foot is authorized. Workers on the facility have free access to all areas within the unit boundary. The area is accessible to all wildlife.

4. On July 22, 1984, the FWS sampled soil from the Swanson River Field facility. It was found to be contaminated with polychlorinated biphenyl (PCB) and DDT; elevated levels of certain heavy metals were also found in some samples. Subsequent sampling and chemical analysis by the Environmental Protection Agency (EPA) and the Respondent substantiated some of the initial findings of the FWS. The types and concentrations of materials found (they are hereafter referred to as the "contaminants of concern") are shown on Table 1. The laboratory analysis findings of the EPA and Respondent are given in Tables 2 and 3, respectively.

5. The contaminants found are known to be persistent compounds which can accumulate in the food chains and in the environment, and can be toxic to aquatic organisms, wildlife, and man. Laboratory experiments with animals and bacteria along with limited epidemiological studies of humans suggest that the contaminants are potential carcinogens.

6. Oil-contaminated sand and gravel resulting from incidental oil leaks and/or spillages were deposited on the ground surface at a storage/disposal site referred to as SCU 14-3. SCU 14-3 was established in the early 1970's with the knowledge and consent of the Kenai NWR Manager. Since then, the Respondent has operated the SCU 14-3 site as a repository for oily wastes generated in the course of the production activities of the Field.

7. Pursuant to surface oiling permits obtained from the ADEC and approval from the Refuge Manager in 1983 and 1984, the Respondent used oily sand and gravel on certain roads and parking lots of the

facility to control fugitive dust. Prior to the sampling program referred to in Finding # 4, neither the Respondent nor the Refuge Manager had any knowledge that the sand and gravel from SCU 14-3 was contaminated with PCB's. The ADEC was not aware at any time that pit SCU 14-3 existed as a repository for oily sand and gravel.

ALLEGATIONS

The State of Alaska Department of Environmental Conservation (ADEC) alleges that:

1. The Respondent is responsible for (1) conducting road oiling activities, (2) operating an oil-contaminated soil storage and/or disposal facility known as SCU 14-3, and (3) operating oil production facilities, all of which are within an area located in the Kenai NWR, commonly referred to as the Swanson River Field;

2. During the surface oiling seasons of 1983 and 1984 near Sterling, Alaska, in the Third Judicial District of the State of Alaska, the Respondent applied PCB-contaminated soils to roads in the State of Alaska from a storage or disposal site known as SCU 14-3 in violation of the terms of Surface Oiling Permits issued by the ADEC, which, if true, constitutes a violation of 18 AAC 75.010(a);

3. For the past several years near Sterling, Alaska, in the Third Judicial District of the State of Alaska, the Respondent engaged in the disposal of oily sand and gravel material onto lands in the State of Alaska at a site referred to by the Respondent as SCU 14-3, without first obtaining a waste disposal permit, which, if true, constitutes a violation of AS 46.03.100;

4. For the past several years near Sterling, Alaska, in the Third Judicial District of the State of Alaska, the Respondent engaged in the disposal of oily sand and gravel onto lands in the State of Alaska at a site referred to by Respondent as SCU 14-3, thereby polluting the lands in the State of Alaska, which, if true, constitutes a violation of AS 46.03.710 and AS 46.03.740.

CONCLUSIONS OF LAW, CODIFIED REGULATIONS, AGREEMENTS, AND STIPULATIONS

1. The Swanson River Oil Field is defined as a "facility" under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 et. seq.).

2. Polychlorinated biphenyl (PCB), which was released into the environment, is a "hazardous substance" pursuant to 42 U.S.C. 9601(14).

3. The PCB's found in the soil constitute a "hazardous substance release" into the environment pursuant to 42 U.S.C. 9601(22).

96-379 O - 89 - 18

4. Any violation of Federal environmental law is, in effect, a violation of the lease terms and is subject to appropriate BLM enforcement action.

5. As operator of the Swanson River Field, the Respondent must comply with all statutes and regulations of the State of Alaska.

ORDER BY CONSENT

Based upon the findings and determinations set forth above, it is hereby ORDERED and DIRECTED as follows:

1. Commencement Time. The Respondent is obligated to obey, and to comply with, the terms and provisions of this ORDER as of the "Commencement Time," which date is specified on the signature page of this ORDER.

2. Providing Information to FWS. By not later than 15 days from the commencement time, the Respondent shall deliver in written form to the FWS at Anchorage, Alaska, certain information set out below. The information shall be sent to Robert E. Gilmore, FWS Regional Director, 1011 East Tudor Road, Anchorage, Alaska 99503. The Respondent may assert claims of confidentiality for certain information.

   A. A narrative description of operation at the facility including any records of placement of oily sand and gravel within the Swanson River Field. In addition, the description should include any spills of hazardous substances as defined under Section 101(14) of CERCLA which have occurred in the Swanson River Field.

   B. An inventory of any item that contains PCB fluids or materials. List by identification number and indicate item concentration, if possible.

   C. An inventory identifying petroleum compounds (manufactured products) and hazardous substances (CERCLA) other than PCBs, which are utilized at this facility.

3. Daily Record of Activities. During the pendency of this ORDER the Respondent shall maintain a written record of daily activities under this ORDER. This record shall be available to the On-Scene Coordinator (OSC) upon request. The Respondent shall submit a written summary of its activities to the OSC on a monthly basis. The OSC will be Robert Delaney, Refuge Manager of the Kenai NWR.

4. Providing Site Security. Not later than six (6) calendar days after the commencement time, the Respondent shall begin to enclose the sump pit and stockpile of contaminated soil at the SCU 14-3 site with fencing approved by the OSC which will restrict access by both humans and wildlife. The stockpile will be covered with an OSC-approved impervious cover to prevent runoff and leaching. Key points will be posted as determined necessary by the OSC. The posting sign and location areas must meet OSC requirements. Similar site-security measures might also be imposed if results from area-wide sampling reveal additional contaminated sites.

5. Prohibitions. During the pendency of this ORDER, the Respondent shall not:

   A. Allow persons other than the Respondent, employees of the Respondent, and persons designated by the Respondent, FWS representatives, EPA representatives, BLM representatives, and ADEC officials to have access to areas of the facility where materials containing hazardous substances are located. All persons entering the Field shall notify the Respondent's Field Office.

   B. Transfer or move any PCB-contaminated soil and gravel or other contaminated material from its present location at the facility until authorized by the OSC.

   C. Allow or engage in activities which fail to comply with Title 15 U.S.C. 2601 et seq. (TSCA), 42 U.S.C. 6901 et seq. (RCRA), 42 U.S.C. 9601 et seq. (CERCLA); Title 40, Code of Federal Regulations, Parts 761, 263, and 265; Title 49 Code of Federal Regulations, Part 177; and Title 43 Code of Federal Regulations, Parts 3000, 3100, and 3160.

   D. Perform any activities related to this ORDER not authorized by the OSC or not previously authorized in writing by the FWS.

6. Safety. In carrying out the provisions of this ORDER, the Respondent shall provide for the immediate safety and health of workers and other authorized persons, as well as for protection of the environment and associated fish and wildlife.

MANDATORY REQUIREMENTS/COMPLIANCE SCHEDULE

The Respondent shall conduct each of the following activities within the specified period for compliance:

1. Within thirty (30) days of commencement time, designate, retain, and/or employ a person acceptable to the FWS who is qualified by education and experience to design, implement, and supervise all activities listed in this paragraph.

2. Within forty (40) days of commencement time, prepare and submit Sample Collection Plan which will meet the following goals:

   A. Identify those areas within the Swanson River Field where remedial action is required; and

   B. assess the impact, if any, that the contaminants of concern have had on fish or wildlife in the Refuge.

The Sample Collection Plan shall be prepared in accordance with the following guidelines:

a. Soil and aquatic sediments: samples should be collected from locations within the facility where contaminants of concern may have been collected, stored, spilled, discharged, or applied, including:

   1) P&S Warehouse and Yard Area and associated drainage

   2) 1-33TS Area and associated drainage

   3) Compressor plant facility and associated drainage

   4) Areas upon which contaminated road surfacing material was applied for dust control and associated drainage

   5) Area and associated drainages surrounding the SCU 14-3 sump and stockpile

   6) Any other areas of concern designated by the OSC.

b. Groundwater: samples should be collected from wells installed in the vicinity of SCU 14-3.

c. Biota: samples from representative species (i.e., terrestrial avifauna and mammalian fauna living in close association with the ground and/or soil environment; selected fish, aquatic gastropods and bivalves) should be collected at locations selected on the basis of Figure 1.

Specific sampling locations shall be identified and justified in the Sample Collection Plan, and shall include a number of locations selected for the purpose of establishing background levels.

The Sample Collection Plan shall be submitted to FWS for approval.

3. Within forty-five (45) days of commencement time, prepare and submit a Sample Analysis Plan which shall include:

   A. Standard analytical methods used by approved laboratories for determining the contaminants of concern in soil, suspended and deposited aquatic sediments, surface and ground waters and organs and tissues of selected terrestrial and aquatic organisms.

   B. Analysis of not less than the following:

a. "Natural Background" Sampling Sites

1) PCB, DDT, and Metabolites

2) Metals:

Arsenic	Lead
Cadmium	Mercury
Chromium	Nickel
Copper	Zinc

b. Swanson River Field Sampling Sites

1) PCBs (all arochlors)
DDT and Metabolites

2) Metals
8 metals, same as for Natural Background

3) 2, 3, 7, 8 tetrachlorodibenzodioxin; 2, 3, 6, 7 tetrachlorodibenzofuran
Five samples from segregated sites in the area around the compressor plant.

C. A laboratory selected by mutual consent will be used by the Respondent for conducting analysis of contaminants of concern. It is agreed that the FWS Patuxent Wildlife Research Center Laboratory will insure "Laboratory Quality Assurance" control of the approved laboratory. Quality control effort shall include but not be limited to a review and approval of laboratory analytical technique, sample checks, dual sampling (10% split sampling), sampling procedures and sample handling.

D. All samples sent to the approved laboratory shall be analyzed for contaminants of concern on a dry weight basis for soil and sediment and on a wet weight basis for all biological samples. The analyses must be performed according to methods deemed satisfactory to the FWS. The results of these analyses shall be submitted to Howard Metsker, U.S. Fish and Wildlife Service, 1011 East Tudor Road, Anchorage, Alaska 99503.

E. Analytical results must meet performance criteria acceptable to the FWS. Failure to meet these criteria can result in the Respondent having to reanalyze the samples or perform additional sampling.

F. The Sample Analysis Plan shall be submitted to the FWS for approval.

G. The Respondent shall conduct the required sampling as specified in the approved Sample Collection Plan.

4. Within ninety (90) days of submission of final analytical results, the Respondent shall submit to the FWS and ADEC a Mitigation and Restoration Plan for the Swanson River Field. This plan shall be implemented as amended and approved by the FWS and ADEC. Respondent shall have the right to participate in all FWS and ADEC discussions concerning amendments and approval of the plan.

   A. The mitigation and restoration plan must be based upon:

      a. Assessment of the results from the sample collection and analysis specified in items 2 and 3.

      b. An environmental quality standard for the protection of the Refuge based on a risk assessment to be performed by the Respondent and approved by the FWS and ADEC.

   B. The mitigation and restoration plan requirements for the handling and disposal of contaminated material must include the following:

      a. Within thirty (30) calendar days of the signing of this ORDER, the Respondent shall prepare for ADEC and FWS approval a plan for stabilizing and containing those areas presently known to contain over 50 ppm PCB, including the SCU 14-3 sump and stockpile. Said plan must provide measures for preventing any contaminants from migrating into surrounding soil or coming into contact with surface or ground waters. Following approval, this plan shall be executed expeditiously, but no later than December 31, 1985. Within 150 days of approval of the mitigation and restoration plan, but in no event later than December 31, 1986, the Respondent shall eliminate all material found to be contaminated over 50 ppm in the manner approved by the ADEC and FWS in the mitigation and restoration plan.

      b. Other contaminated materials found to exceed the standards of this ORDER must be removed for containment in accordance with a schedule to be included in the Pollution Mitigation Plan.

   C. Plans for removal and containment of any contaminated materials must be reviewed and approved by the FWS, in consultation with BLM, ADEC, and EPA, prior to such removal.

   D. Storage and disposal will be in accordance with Federal and State laws and regulations. Plans for said storage and disposal shall be submitted to the FWS for review and approval.

5. Amendment of Annual Development Plan. The Respondent's complete plan, developed in response to this ORDER, shall be submitted to the FWS and BLM as an amendment to Chevron's Annual Plan of Development and Operation for the Swanson River Field.

6. Compliance With All Laws. In performing activity directed by this ORDER, the Respondent shall comply fully with all requirements of applicable Federal, State, and local laws. No provisions of this ORDER operate to excuse the Respondent from complying fully with all other environmental laws and regulations.

7. Miscellaneous.

   A. The provisions of this ORDER shall obligate this Respondent and all successors and assignees of the Respondent. If the Respondent transfers, sells, assigns, or leases this facility prior to its fulfillment of the provisions of this ORDER BY CONSENT, the Respondent must incorporate a copy of this ORDER into the documents of transfer, sale, assign or lease, and must provide in those documents that the new owners or lessees will take or lease subject to compliance with this ORDER BY CONSENT.

   B. This ORDER is entered into by the Respondent voluntarily for the purpose of avoiding unnecessary conflict or litigation over this matter. In consideration thereof, the FWS, BLM, and ADEC agree not to pursue any other civil, criminal, or administrative relief, including penalties, against the Respondent, or its successors or assignees, in connection with this matter so long as the provisions of this compliance ORDER BY CONSENT are met; except that the FWS, BLM, or ADEC shall be entitled to seek enforcement of this ORDER by a court of competent jurisdiction. Nothing in this ORDER shall be construed to any extent or for any purpose, however and whenever arising, as an admission of liability or violation, directly or indirectly, on the part of the Respondent, its successors, or assignees.

   C. No provision of this ORDER affects any right, claim for relief, or cause of action held by persons other than the Respondent, FWS, BLM, and ADEC.

   D. The provisions of this ORDER may only by modified or amended upon the express written consent of the Respondent, FWS, BLM, and ADEC.

   This document will be recognized by the Respondent as a Compliance Order by Consent under Alaska Statutes 46.03.850 and under the jurisdiction of the State of Alaska.

8. Opportunity to Confer. The Respondent may at any time request to confer with the FWS concerning the terms and provisions of the foregoing ORDER. All requests to confer shall be confirmed in writing and justified. In any such conference held pursuant to a

request of the Respondent, attorneys and other representatives of the Respondent may be present and may present on benalf of the Respondent whatever objections, contentions, comments, or requests the Respondent may have. Requests for any such conferences should be addressed to:

Robert E. Gilmore, Regional Director
U.S. Fish and Wildlife Service, Region 7
1011 East Tudor Road
Anchorage, Alaska 99503
PH: (907) 786-3542

The Respondent acknowledges, by execution of this Consent Order, that it is waiving rights which would attach otherwise to the procedure for issuance of a compliance order under 18 AAC 95, including the right to an adjudicatory hearing and judicial review of the Alaska State Department of Environmental Conservation's findings in this matter, and that these rights are knowingly and voluntarily waived,

9. Cost Recovery. The Respondent shall be responsible for all appropriate costs authorized by the OSC in connection with the implementation of this ORDER. The OSC will provide the Respondent with an itemized accounting of all expenses authorized pursuant to this ORDER.

10. Organization of Response.

A. The organization chart (Figure 2) identifies the structure of the response team and interactive coordination between the OSC, Federal and State agencies, and the Respondent.

B. The Respondent has the first responsibility to take all appropriate action to remove the contamination and restore the environmental quality of the affected areas.

C. The FWS has the primary responsibility to insure that all response actions are performed in a manner least disturbing to the environmental and biological integrity of the surrounding refuge. All activities must be performed under the supervision and full approval of the OSC.

D. The FWS shall serve as the public relations coordinator in connection with this matter, and will respond to inquiries from the public on cleanup efforts. The Respondent shall have the right to review and comment upon any written statements which the FWS proposes to make to the public or news media.

E. Procedures and guidelines shall conform to the "National Oil and Hazardous Substances Contingency Plan" as amended.

U.S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

Concur: Robert E. Gilmore Date: 7/31/85
Robert E. Gilmore
Regional Director

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT

Concur: Robert M. Andaya Date: 7-31-85
M.J. Penfold
State Director

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Concur: Bill H. Lamoreaux Date: 7/31/85
Bill Lamoreaux
Regional Supervisor
Southcentral Region

CHEVRON USA INC.

Concur: J T Cameron Date: 8/6/85
J. T. Cameron
Vice President
Western Region EL&P
CHEVRON USA INC.

COMMENCEMENT TIME OF THIS ORDER SHALL BE August 6 1985
Date

1988 Narrative - Kenai NWR

are now temporarily stockpiled within a lined and bermed holding facility at the Beaver Creek Number Seven Well Pad. Final results of contaminated soil and water analysis, accompanying a mitigation plan for the remaining cleanup, has not been received for agency review and approval.

The Beaver Creek Field includeds six producing wells - four natural gas and two crude. Average daily crude oil production for the year was 539 barrels/day while natural gas production was 37,570 Mcf/day. Cumulative production through December 1988 was 3,661,366 barrels of crude and 77,232,933 Mcf natural gas. Natural gas is transported through Kenai Peninsula pipeline facilities for utilization in the Anchorage Bowl area. Produced crude is regularly trucked 34 miles daily to North Kenai refinery facilities.

(2) Swanson River Oil Field

ARCO Alaska, Incorporated, Field Unit Operator, drilled no new wells this period but did complete several well workovers. During the year, about 27 wells were in production at any time, dependent upon maintenance and other work programs. Daily production averaged 5825 barrels/day with cumulative production through December at 209,462,011 barrels. The thirty-year cumulative total represents a recovery of nearly 46 percent of the estimated barrels of original oil in place.

The PCB-remediation project at Swanson River continued for the second season with a new primary contractor - Ogden Environmental Services of San Diego - responsible for the excavation and processing of PCB-contaminated soils. The contractual relationship with ARCO's original cleanup contractor, American Toxic Disposal of Illinois, and SRH Associates was terminated. Martech Construction of Anchorage, Alaska, became the excavation subcontractor for Ogden.

Ogden was contracted by ARCO to bring their Transportable Circulating Fluidized Bed Combustor on-site to thermally destroy stockpiles of PCB-contaminated soil. Under Title 40, Part 761, in the Code of Federal Regulations, Ogden must first obtain a permit from the U. S. Environmental Protection Agency of Toxic Substances before they process soils containing regulated concentrations of PCBs. The permit requirements for the disposal of PCBs are regulated under the Toxic Substance Control Act, Public Law 94-469 (1976).

From 1962 to 1972, Aroclor 1248 was used as a heat transfer oil in the process heat system of the propane recovery unit within the compressor complex at the Swanson River Field. A 1972 explosion at this facility released an unknown quantity of the PCB-containing oil. The operational procedures in use at that time directed the final disposal site for the contaminated soil and snow to the SCU 14-3 pit holding facility. Oily

1988 Narrative - Kenai NWR

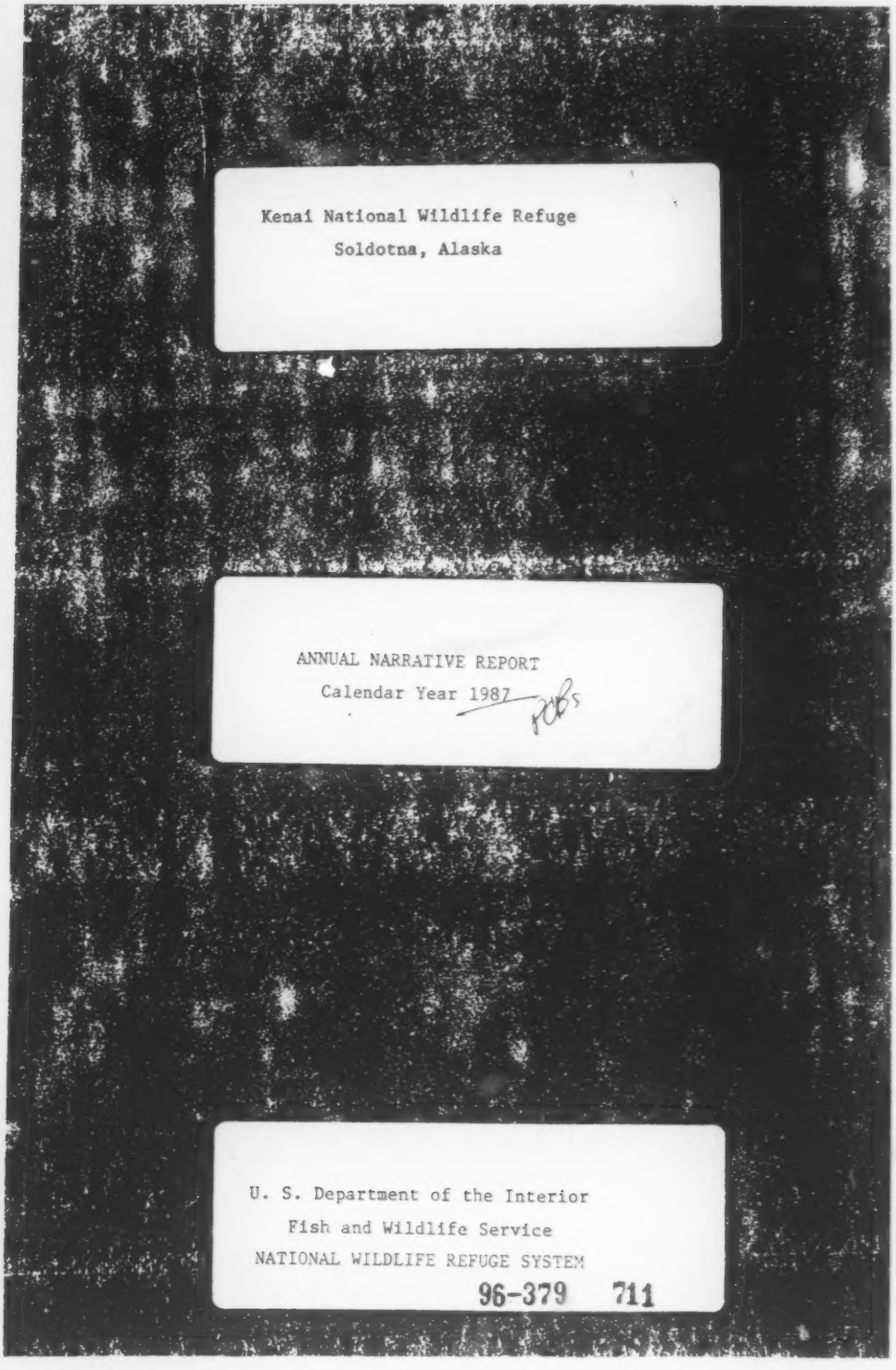
sand and gravel from this facility was later used for dust suppression and maintenance on approximately two miles of roads within the Field. Responsible parties and regulatory agencies were unaware at that time that the material was contaminated with PCBs.

As previously scheduled, PCB work resumed March 11 at the SCU 14-3 pit facility. The still-frozen pit conditions permitted heavy equipment to negotiate the pit floor and excavate contaminated soils from the sides and floor, transporting those materials to the main holding pit area for future processing. Unfortunately, the proposed two- or three-week excavation of the SCU 14-3 waste pit turned into a several-week project following the finding of free hydrocarbons (oil) containing PCBs outside the original pit perimeter. This find necessitated the excavation of adjacent overburden soils to expose and delineate the extent of soil contamination. Removal of those soils to the on-site designated lined holding facility was completed 9 June.

The Circulating Bed Combustor Unit, the permitted portable facility utilized to terminally destroy PCBs in these contaminated soils, was fabricated in New Orleans, shipped by truck to Washington, barged to Anchorage, and trucked to the Swanson River Field (21 trailers). The processing unit foundation was formed and poured during early July and the first module of the unit was set in place 19 July. The selected operation crew for the unit underwent intensive training at Ogden's facilities in San Diego and New Orleans on an identical unit at the fabricators.

Startup activities at Swanson River commenced for the new Circulating Bed Combustor Unit during August, with a shakedown by the operation crew. The unit was fired with natural gas, and clean sand and gravel material circulated during shakedown operations. The unit reached a temperature of 1600°F while utilizing several tons of material. A Rapid Turnaround Test (1700°F) was conducted with the unit on September 22 using test-burn material containing concentrations of 1,300-2,800 parts-per-million PCBs. Results indicated destruction and removal efficiencies better than 99.99999 percent and a PCB residual in the purified soil of less than 0.15 parts-per-million.

The official U. S. Environmental Protection Agency Demonstration Test of the Circulating Bed Combustor commenced 24 September. A total of six test runs were conducted through 27 September, processing more than 162 tons of contaminated soils. Combustion efficiency was 99.95-99.97 percent. The purified soil analytical results detected no residual PCBs at the level of detection. The Demonstration Test results indicate the Circulating Bed Combustor Unit performed as planned and met Toxic Substances Control Act requirements for the destruction of PCBs.



Kenai National Wildlife Refuge
Soldotna, Alaska

ANNUAL NARRATIVE REPORT
Calendar Year 1987

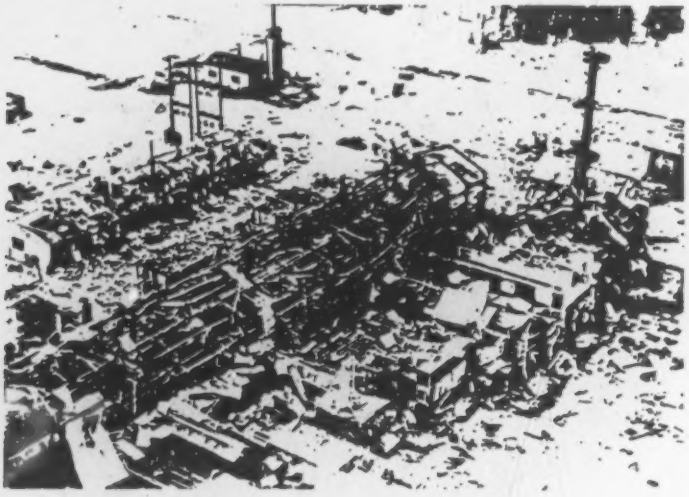
U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

96-379 711

barrels/day (6100 barrels/day in December), and cumulative production through December 31 was 207,309,141 barrels. This cumulative total represents a recovery of nearly forty-six percent of the estimated barrels of original oil in place.

Following the minor gas blowout at well Soldotna Creek Unit 11-16 in December 1986, cleanup continued at the adjacent 3-9 Tank Setting/drilling pad. Produced subsurface material and pad soiled gravels were trucked to the approved Field solid waste facility. A workover rig was engaged to plug and abandon three of the four wells located on this well pad.

Without doubt, the most time consuming project for the staff was the continuation of the polychlorinated biphenyl remediation project. American Toxic Disposal of Illinois, ARCO's original contractor for the project, engaged SRH Incorporated as a subcontractor responsible for the excavation of contaminated soils from localized roads and parking areas within the Field.



This is where it all happened January 26, 1972. A natural gas explosion at this plant facility sprayed Therminol containing polychlorinated biphenyl over the snow covered area. RR

On May 13, Refuge Manager Doshier and Assistant Refuge Manager Richey met with the site contractor John Spencer of SRH, Jim Ives of ARCO, Geoffrey Upson of Ecology & Environment, and dirt contractor Harold Jackson of Jackson Construction, to discuss and approve the proposed development of the contaminated soil stockpile processing site to be located adjacent the Soldotna Creek Unit 14-3 well pad facility. Site development was completed by June 1, followed by the lining of a large contaminated soil holding facility, the installation of a dump truck weighing scale house, and placement of office trailers, generator, and fuel support facilities.

The first truck load of material from the adjacent original pit stockpile was weighed (9 Tons) and dumped into the lined pit June 18. Subsequent hauls by June 26, transferred all 2780 Tons of that stockpiled material into this lined facility. The excavation of contaminated material from the "closed road" near the compressor facility began June 30.

The first load of contaminated material was dumped into the lined stockpile immediately adjacent to the future processing site facility. RR

Ecology & Environment, Incorporated, contracted by ARCO to conduct chemical analysis of polychlorinated biphenyl levels, screened approximately 300 soil samples in the On-Site Analytical Service Center Lab using approved Environmental Protection Agency Methods 3550 and 8080 to further delineate the extent of polychlorinated biphenyl contaminated areas around the compressor plant facilities and other areas. Five soil samples were randomly selected from about ninety collected. The Ecology & Environment lab splits (5) from these samples were then shipped June 22 to the Patuxent Analytical Control Facility, Laurel, Maryland, for duplicate Method 8080 comparison analysis to resolve any analytical differences that might have occurred between the Ecology & Environment and Service Labs. Results of these comparisons were extremely close, thereby supporting the field lab analysis.

More than 6000 soil samples were collected for polychlorinated biphenyl analysis and delineation mapping of contaminated areas, both vertically and horizontally. RR

An agency meeting at the Anchorage Regional Office June 5, was attended by Refuge Manager Doshier and Assistant Refuge Manager Richey to review for approval the proposed errata for the Mitigation and Restoration Plan for PCBs, Swanson River Field. An agency meet was held June 16, with representatives from Alaska Department of Environmental Conservation, Environmental Protection Agency, Bureau of Land Management, ARCO Alaska, Incorporated, and the on-site contractor, SRH, Incorporated. The status of the required Environmental Protection Agency Toxic Substances Control Act permit for the thermal unit proposed for the on-site polychlorinated biphenyl separation process at Swanson River was discussed.

By August, the access roads contaminated with polychlorinated biphenyl within the Swanson River Oil Field had been cleaned up and reopened for vehicular use. However, the original site characterization indicated the general location of contamination but underestimated the quantity (15,145 tons). Contamination material on the roadways was deeper and extended further down the shoulders than earlier information indicated, in addition to other contaminated areas located at the compressor complex facilities. This nearly doubled the amounts of contaminated soils to be excavated, necessitating an extension of the constructed 17,500 ton lined stockpile holding facility to now accommodate almost 29,000 tons.

Polychlorinated biphenyl contaminated road gravel was excavated in rows to facilitate recovery operations.

RR

Marathon Oil Company

Telephone 907/561-5311

Route	Action
RM	MM1
RRM	EO
AO	MW
OG	AT
RWE	CT1
WR	CT2
REC	SA
SP	Ack
PT	File
TIR	13
*M	

March 4, 1988

Mr. Robert Richey
U. S. Fish & Wildlife Service
P. O. Box 2139
Soldotna, AK 99669

Dear Mr. Richey:

This is to notify you that on August 17, 1987, a glycol spill occurred at facilities operated by Marathon Oil Company in the Beaver Creek oil and gas field. A dump valve on the thermal pack at Pad #7 was damaged with sand and prevented produced water from exiting the dehydrator to the water storage tank. Consequently, the gas gathering system provided a conduit for excess water which then flowed to Pad #1A, comingled with triethylene glycol in the dehydration unit, and overflowed from the reboiler vent line onto the ground near the dehydration building.

Approximately 12 barrels of triethylene glycol spilled at the east end of the dehydration building, some of which migrated around to the north end of the building. Offsite migration was prevented by berms located near the building. The spill was confined to an area of about 360 square feet on the pad. The following day contaminated soil was removed to a depth of approximately 1.5 feet by backhoe and placed in plastic-lined pallet boxes. About 20 cubic yards of contaminated soil was removed and is presently being stored until it can be disposed in Marathon Oil Company's new Kenai landfill when permitted. After the cleanup at Pad #1A, the area of disturbance was regraveled. The faulty valve has been replaced to reduce the probability of similar occurrences.

+ by Land Shovel! stored in wooden crates, lined w/ plastic + bermed on pad #7. RE

I realize that this letter should have been sent to you earlier but through an oversight, immediate notification was neglected. Marathon apologizes for the delay. If you need further information, please do not hesitate to call.

Sincerely,

Bob Elder

BOB ELDER, Ph.D.
Environmental Representative

cas:ES12:44

2- Veh Accidents

TRUCK MISHAP RESULTS IN CRUDE OIL SPILL AT BEAVER CREEK FIELD

A tractor and trailer hauling crude oil from the small Beaver Creek oil field on the Kenai Peninsula spilled an estimated 64 barrels of oil when the tank trailer rolled over as the rig was leaving the field November 6, according to a spokesman for Marathon Oil Company. The oil spilled from a vent pipe and was cleaned up by stripping off snow and surface vegetation. The field is in the Kenai National Wildlife Refuge and the disturbed area will be restored to U.S. Fish and Wildlife Agency specifications.

Production
Production Operations U.S. & Canada

Marathon Oil Company

P.O. Box 2380
Anchorage, Alaska 99510
Telephone 907 274-1511

Rec. 2/19/82
Hand Carried
By Dan Erwin
11:45 Station Okl.
BY

February 17, 1982

U. S. Department of Interior
Fish and Wildlife Service
Kenai National Wildlife Refuge
P. O. Box 2139
Soldotna, Alaska 99669

Attention: Mr. Bob Delaney

Gentlemen:

Marathon Oil Company, as operator of the Beaver Creek Unit, proposes to undertake a program of safety related alterations to the existing Beaver Creek Field access road. The work will involve the modification of curves 1, 2, 3, and 5, the realignment of curve 4, and the repair of an existing bridge crossing Beaver Creek (see enclosed plat).

The existing road serving the Beaver Creek Oil and Gas Field was constructed in November and December of 1966 in connection with the drilling of the discovery well "Beaver Creek" No. 1. This access road was developed as a winter road intended for temporary access only and was routed so as to do minimal surface damage; sharpness of curves and steepness of grades were of secondary consideration. Beaver Creek Field is now in the development stage. The access road following its original route is carrying an increasing traffic load of both light vehicles and heavy trucks. This increase of traffic has made the access road hazardous. As an example, in November, 1981, an oil haul truck overturned on curve No. 4 resulting in an oil spill. The accident was in large part the result of a blind curve at the bottom of a downgrade. The following proposed alterations will help alleviate these numerous hazardous conditions.

Curve No. 1, as shown on the enclosed plat, is a blind curve due to a small shrub covered knoll on the inside of the curve. The alteration of this curve would involve cutting approximately 15 to 20 feet from the side of the knoll. The material removed would be "bloated" to the inside of the curve increasing the radius of the curve. The road width at the apex of the curve would be increased approximately 15 feet. This proposed alteration will require [illegible] Corps of Engineers approval.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

March 13, 1989

Honorable J. Bennett Johnston
Chairman, Committee on Energy
and Natural Resources
United States Senate
Washington, D. C. 20510

Dear Mr. Chairman:

This is in further response to your letter of March 8, 1989, to Secretary Lujan enclosing questions for the Record of the March 6, 1989, hearing on S. 406 to authorize oil and gas activities on the coastal plain of the Arctic National Wildlife Refuge.

We are enclosing our additional responses to the questions you forwarded from Senators Bradley and Wirth. If we can be of further assistance, please let us know.

Sincerely,

James M. Hughes
Assistant to the Secretary
for Congressional and
Legislative Affairs

Question from Senator Wirth

QUESTION: Mr. Johnston's amendment #3 says that the Fish and Wildlife Service wouldn't have to look at specific actions that had to do with oil development in ANWR to see if there were compatible with the purposes of the refuge. That would make this refuge different from every other refuge, wouldn't it? Do you support this amendment?

ANSWER: Enactment of the proposed Johnston amendment #3 would not make the Arctic National Wildlife Refuge different from other refuges, in that activities specifically mandated by law to occur on a refuge are not subjected to the compatibility test. Compatibility determinations are made when the Fish and Wildlife Service is considering whether to approve any proposed use of a refuge not mandated by law.

We do not support amendment #3. We believe the precedent established if Congress determines that oil and gas activities are compatible with refuge purposes in this case might make it virtually impossible to justify determinations of non-compatibility for most currently prohibited activities in the rest of the Refuge System.

We accordingly believe the coastal plain oil and gas activities should be carried out under a different environmental standard stated as the sole authority of authorizing legislation. S. 406 provides for this in section 201(b), and we provided the Committee staff with language to clarify that these provisions exempt coastal plain oil and gas activities from the compatibility provisions of the National Wildlife Refuge System Administration Act.

Question from Senator Wirth

Question. How does the Department's recommendation to open ANWR to oil and gas leasing fit into the overall energy policy of the Administration? Please give us the Administrations's plan for ensuring the energy security of the United States?

Answer. Leasing ANWR oil and gas has a high priority in the Administration's energy policy because of the very substantial addition to reserves and production it could yield near the turn of the century. This is a period when it is quite possible that the United States will be hard pressed to protect its economy from the effects of price setting in the world oil market.

The Administration is currently reviewing the National Energy Policy Plan as required by P.L. 95-91. Although this review is not complete, it is clear that certain elements of the previous National Energy Policy Plan are so effective at meeting the nation's future energy and economic needs that they will be continued. Such elements include the Strategic Petroleum Reserve, a variety of research efforts in conservation and alternative energy sources, and ANWR leasing. ANWR's oil potential is so great that we cannot afford to forego the gains it will bring to the economy during the 2000-2030 period.

If we are to improve the energy security of the United States, we will need to employ a wide variety of energy efficiency and production measures in varying combinations as future conditions change. During the current period when oil prices are relatively low, fewer new energy efficiency measures and oil development projects can be undertaken while still maintaining our economic productivity and competitiveness. While the Administration supports a wide variety of cost effective conservation efforts, many of the more costly projects must wait.

In the medium term, 2000-2030, it is quite likely that much higher oil prices will prevail. This will make it economical to employ additional energy efficiency improvements and expand our investments in new oil production capacity. Higher oil prices will create strong incentives for firms and households to be more efficient in their energy use. Conservation will increase just as it did in the 1979-1985 period. The Administration clearly recognizes the need for such additional conservation.

Even with substantially increased conservation, the U.S. economy will also benefit substantially from bringing ANWR production on line during the first decade of the 21st century. Because of the long lead times involved, we need to begin the process now in order to be in a position to reap these benefits in the 2000-2030 period.

In short, we do not have the luxury of regarding ANWR oil production and additional conservation as substitutes. We will need both if we are to maintain our position of economic leadership in the 21st century.

Question from Senator Bradley

QUESTION: I. One of the purposes of S. 406 is to provide a "new source of funding for ... the acquisition, protection, creation and restoration of wetlands." Does the Administration have a position on this fund? Can the Administration explain where such a fund would be applied? Does this duplicate other funding procedures within the LWCF? The funding would be "subject to such terms and conditions as the Secretary may prescribe." What are these?

ANSWER: The Administration is opposed to creation of this fund, or to any other earmarking of ANWR revenues. We believe they should be deposited in the general fund of the Treasury. The competing demands for these and other Federal dollars could then be resolved through the budget and appropriation process.

However, if the bill were enacted as presently written, there are existing accounts in which the funds could be deposited. Monies could be deposited in the Migratory Bird Conservation Fund, and used for wetlands acquisition and protection as provided in the Migratory Bird Conservation Act. Funds could also be used for wetlands creation and restoration under the Emergency Wetlands Resources Act and in conjunction with the North American Waterfowl Management Plan. The Administration fiscal year 1990 budget includes a request for an additional $3.7 million for joint North American Plan ventures with States and private groups.

Despite the Administration's support for these programs, and the President's strong personal concern, we must again emphasize that current fiscal realities do not permit us to recommend significant additional funding in this area.

None of these programs come under the Land and Water Conservation Fund and would not duplicate any of the acquisitions funded from that account.

Since all of these are existing programs, there would be no need for additional "terms and conditions" to be prescribed, other than an allocation of funds between the programs. Barring direction to the contrary from the Congress, there would be no effort to create new programs to utilize the funds.

Question from Senator Bradley

Question: III. When will the Administration have a more detailed position on section 403 of S. 406, the Liability and Reclamation Fund? Could you estimate for us the costs of restoring wetlands and tundra? Is there a reason that the Reclamation Fund should be administered by the holder of the Trans Alaska Pipeline right of way rather than the Department of the Interior?

Answer: We support the establishment of the Liability and Reclamation Fund contemplated by section 403. As you are aware, the Department of Justice has some concerns about its constitutionality because of the operation of the Fund by a private entity empowered to perform functions reserved to the Federal Government. We believe that the Department of the Interior should manage the Fund. We have provided committee staff with an amendment that would so amend section 403. With respect to your question regarding the cost of restoring wetlands and tundra, without details on what damage has been done, it is difficult to develop estimates relating to those costs.

Question from Senator Wirth

Question:

Would you support putting some of the Coastal Plain of ANWR in wilderness?

Answer:

We need to answer this question by clarifying our terms. The term "Coastal Plain of ANWR" has two distinct meanings, one geographic and the other legal. The geographic "Coastal Plain of ANWR" refers to all those lands within ANWR between the Beaufort Sea on the north and the Brooks Range on the south, and the Staines and Canning Rivers on the west and the Canadian border on the east. The legal "Coastal Plain of ANWR" refers to that smaller area within the geographic Coastal Plain defined in section 1002(b)(1) of the Alaska National Interest Lands Conservation Act (ANILCA).

That part of the geographic Coastal Plain lying between the Aichilik River (the eastern border of the legal "Coastal Plain") and the Canadian border was formally designated by Congress as wilderness in 1980 in section 702(3) of ANILCA. This Coastal Plain wilderness area comprises approximately 500,000 acres of the total 8 million acres within ANWR designated as wilderness.

Prior to 1980, the entire geographic Coastal Plain, including that part east of the 1002 area and now designated as wilderness, was thought by the Geological Survey to be prospective for oil and gas, along with the foothills of the Brooks Range. This view of the oil potential of this eastern portion of the geographic Coastal Plain is supported by the seismic data gathered from 1002 study. The Department considers the geology in this eastern area to be similar to that found in the 1002 area. The map printed at page 55 of the Secretary's 1002(h) report shows that some of the structures delineated for the 1002 area are thought to continue into this wilderness area.

As to those lands within the legal Coastal Plain, former Secretary Hodel's recommendation to Congress was that none be designated as wilderness because of their high potential for commercial quantities of oil. This Administration fully concurs with that recommendation.

Question from Senator Wirth

Question: If a bill were passed by Congress that opened the 1002 area to drilling but put some of it in wilderness, would you advise the President to veto such a bill?

Answer: Without reviewing the specifics of such a bill, I cannot say what my recommendation to the President would be in such a case.

Question from Senator Wirth

Question: Would you favor an amendment that would restrict export of any oil from ANWR?

Answer: Restrictions under current legislation are more than adequate. North Slope oil which is transported through the Trans-Alaska Pipeline would be subject to Section 7(d) of the Export Administration Act (EAA). The EAA, I understand, would prohibit exports unless Congress expressly approves the action. Additional statutory restrictions on the export of crude oil are found in Section 103 of the Energy Policy and Conservation Act, and Section 201 of the Naval Petroleum Reserve Production Act. Since current legislation appears dispositive of the issue, I would oppose any additional restrictions.

Question from Senator Wirth

Question: Please provide us with a copy of the Department of Justice's views on the unconstitutionality of part of the revenue allocation provisions of S. 406, and their views regarding the need for an antitrust review provision, to which you refer in your testimony.

Answer: We understand that the Department of Justice sent those views to the committee on March 7, 1989.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

APR 3 1989

Honorable J. Bennett Johnston
Chairman, Committee on Energy
and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

This is in further reference to your letter of March 8, 1989, and our responses for the Record of the March 6 hearing on S. 406 to authorize oil and gas activities on the coastal plain of the Arctic National Wildlife Refuge.

Senator Wirth had asked questions regarding the petition sent to Secretary Lujan by various environmental group representatives. We indicated in our March 10 answer to you that a response to that petition would be forthcoming. We are now enclosing our letter of March 21, 1989, to the petitioners.

Senator Wirth had also asked several questions regarding environmental impacts on the coastal fisheries resource in the Mackenzie River Delta. We have just received the information we had requested from the National Marine Fisheries Service and enclose it for your perusal.

Sincerely,

James M. Hughes
Assistant to the Secretary for
Congressional and Legislative Affairs

Enclosures

RECEIVED
APR 04 1989
WASHINGTON, D.C. 20510

Celebrating the United States Constitution

THE SECRETARY OF THE INTERIOR

WASHINGTON

MAR 2 1 1989

Dear Concerned Citizens:

Thank you for your letters of January 23 to the President and to me. The President has asked that I respond to your concerns. I wholeheartedly agree with you that the issue of energy development on the coastal plain of the Arctic National Wildlife Refuge (ANWR) is one of the most important public land issues facing this Administration and the 101st Congress. Your views will certainly be kept in mind as we formalize policies on this issue for the new Administration. Moreover, I anticipate an open dialogue with you and other concerned groups as the Congress works with us toward resolving this issue.

As you know, the President has repeatedly emphasized his support for environmentally prudent development in the ANWR coastal plain, and I am in total agreement with that position. As I mentioned after the confirmation hearings, there may be some sensitive areas within the coastal plain that should remain closed to oil and gas development. I would expect the debate in Congress to continue to address that issue. You may rest assured that the Department will continue to place a strong emphasis on the ANWR coastal plain issue and that I will be carefully scrutinizing the Department's activities.

In response to your concerns that information on the ANWR coastal plain be reviewed, you should know that the Department is working to improve and regularly update the data base upon which management decisions will be implemented. The Department has long recognized that a variety of regulatory and planning processes would immediately be initiated, should Congress pass legislation allowing further oil and gas activity in the area. Therefore, the U.S. Fish and Wildlife Service has continued to pursue a biological study program for the area. Those studies represent an opportunity to develop a better understanding of fish, wildlife, and habitat relationships that will ultimately translate into improved resource management for the entire Arctic National Wildlife Refuge.

Concerns have been expressed about the impact of exploration and development activities upon the coastal plain values. One of the goals of the NEPA process is to identify those impacts. I can assure you that full NEPA compliance will be undertaken at each phase of the process. Additionally, as Secretary, I have the authority to shut down operations in the event it is determined that negative impacts could exceed the standard established for activities allowed in the area. This is a responsibility I assume, and I assure you I will not hesitate to exercise that authority if warranted.

In the closing days of the previous Administration, the Department of the Interior provided Congress with its Record of Decision on a final legislative impact statement recommending certain ANWR land exchanges. As you are aware, the Department's position has been that no exchanges will proceed without Congressional approval, and I will take no further administrative action.

As you know, the ultimate decision on management of the ANWR coastal plain lies with the Congress. Thus, the issue is being debated in front of the American people with groups such as yours participating in that debate. That is as it should be. This ongoing debate should result in a well-thought-out national approach that will meet all the national interest objectives. The Department stands ready to conscientiously implement the outcome of that debate.

I look forward to participating in the decision on the future management of the ANWR coastal plain and to working with you to ensure that any energy development in the refuge occurs only in an environmentally acceptable manner.

Sincerely,

MANUEL LUJAN JR.

IDENTICAL LETTER SENT TO: JACK LORENZ, PAUL PRITCHARD, GEOFFREY WEBB, MICHAEL CLARK, FREDERIK KRUPP, FREDERIK SUTHERLAND, RUPERT CUTLER

THE SECRETARY OF THE INTERIOR

WASHINGTON

MAR 2 1 1989

Dear Concerned Citizens:

Thank you for your letter of January 23 to the President and your letters of January 23 and March 2 to me. The President has asked that I respond to your concerns. I wholeheartedly agree with you that the issue of energy development on the coastal plain of the Arctic National Wildlife Refuge (ANWR) is one of the most important public land issues facing this Administration and the 101st Congress. Your views will certainly be kept in mind as we formalize policies on this issue for the new Administration. Moreover, I anticipate an open dialogue with you and other concerned groups as the Congress works with us toward resolving this issue.

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Sincerely,

MANUEL LUJAN JR.

IDENTICAL LETTER TO JOHN ADAMS, MICHAEL FISHER, JAY HAIR,
GEORGE FRAMPTON, PETER BERLE

BEAUFORT SEA CAUSEWAY ISSUES: A BRIEFING PAPER

PREPARED BY:
ALASKA REGION
NATIONAL MARINE FISHERIES SERVICE

FOR:
WASHINGTON OFFICE
NATIONAL MARINE FISHERIES SERVICE

MAY 1988

Introduction

The shallowness and seasonal ice cover of coastal waters in the central Beaufort Sea pose special problems for oil and gas exploration and development. The Alaskan petroleum industry has approached these problems by using shallow draft vessels, ice roads, and gravel islands to conduct exploratory activity in coastal waters. However, when development in coastal waters has been pursued, the Alaskan petroleum industry has constructed gravel causeways. Two such structures have already been constructed in the Prudhoe Bay-Sagavanirktok (Sag) River region (Figure 1). A proposal to construct another causeway in the same area was dropped in early 1988. Shortly thereafter, a fourth proposal was submitted for a causeway on the western edge of the Sag River delta.

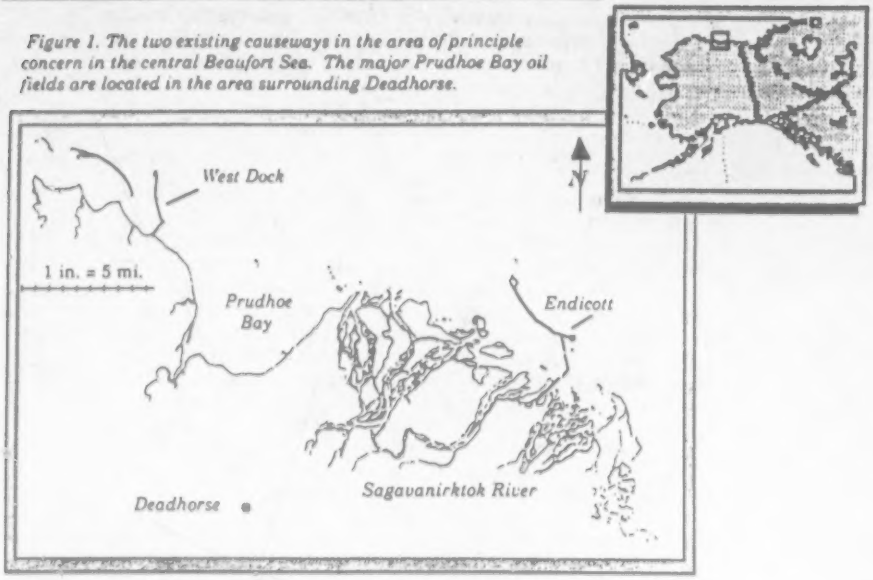
Such proposals do not appear likely to end in the near future. Two causeways have been associated with proposals to allow oil and gas development in the Arctic National Wildlife Refuge. One alternative to produce oil and gas from the Seal Island Prospect requires construction of a causeway. In addition, at least one causeway has been proposed for oil and gas development in the Colville River delta.

The primary resources of concern are populations of anadromous fish which utilize brackish waters located along the Beaufort Sea coast for feeding, rearing, and migration. These fish species obtain more than 80 percent of their annual energy budget in the twelve to fifteen weeks they spend in coastal waters. For the rest of the year, they must survive, grow, and reproduce using the energy gained during the summer. Loss of suitable coastal foraging habitat, therefore, would have significant adverse impacts on these fish populations.

At issue is the question of alternatives. Both of the existing causeways were constructed with minimal consideration of measures that would mitigate impacts to vulnerable fish species while allowing development of petroleum reserves. Those measures that were included in the two existing structures have proven either totally ineffective or only marginally effective in addressing the environmental problems resulting from causeway construction.

This paper provides a brief overview of an issue that has been ongoing for more than a decade and—given current proposals for future projects—appears likely to continue for at least one more.

Figure 1. The two existing causeways in the area of principle concern in the central Beaufort Sea. The major Prudhoe Bay oil fields are located in the area surrounding Deadhorse.



Environmental Setting

The Beaufort Sea is a physically rigorous environment. From September to June, ice up to six feet or more thick is the dominant feature of the Beaufort Sea. Coastal waters are generally frozen to the bottom during this period; those few areas (such as Prudhoe Bay) which have unfrozen water beneath the ice cover can have salinities exceeding 50 ppt and temperatures well below the freezing point. During the winter, anadromous and freshwater fish populations

reside in deep pools in rivers, lakes, and streams where temperatures do not fall below freezing and springs or interstitial flows maintain dissolved oxygen levels.

In the summer, productivity in Beaufort Sea coastal waters increases significantly. Epibenthic zooplankton either migrate or are transported from offshore to forage in the relatively high temperature waters found along the coast. Once there, these organisms are the primary food resource of anadromous fish, marine fish, and waterfowl which forage intensively along the coast.

Anadromous fish in the Beaufort Sea are intolerant of the high salinities and low temperatures of the marine environment. Salinities can exceed their ability to osmoregulate and temperatures regularly approach 0°C, rendering most of the anadromous species torpid and unable to either forage or escape predation. As a result, anadromous fish in the Beaufort Sea forage primarily in river deltas, coastal lagoons, and along protected shorelines. Salinities and temperatures in these areas are moderated by freshwater discharges from coastal rivers and streams, but epibenthic prey organisms are still abundant. These environmental conditions allow anadromous fish to feed on marine-derived prey while minimizing the environmental stress and energetic drain of the marine environment.

The summer feeding season is essential to anadromous fish in the Beaufort Sea. They do not feed during the winter and are dependent upon energy reserves gained during the summer for their survival. Rapid rates of growth observed during the summer are offset by a prolonged period of weight loss during the winter. However, compared to freshwater populations, the survival of anadromous populations is improved by the annual migration to sea. With the possible exception of least cisco, anadromous populations have faster rates of growth, have a larger body size at maturity, reproduce more frequently, and have greater longevity than freshwater populations of the same species.

The life history of the anadromous fish species which are the focus of concern in the Alaskan Beaufort Sea are briefly discussed below. Emphasis has been placed on these species because they are among the most abundant species found in the coastal environment, they are important to the

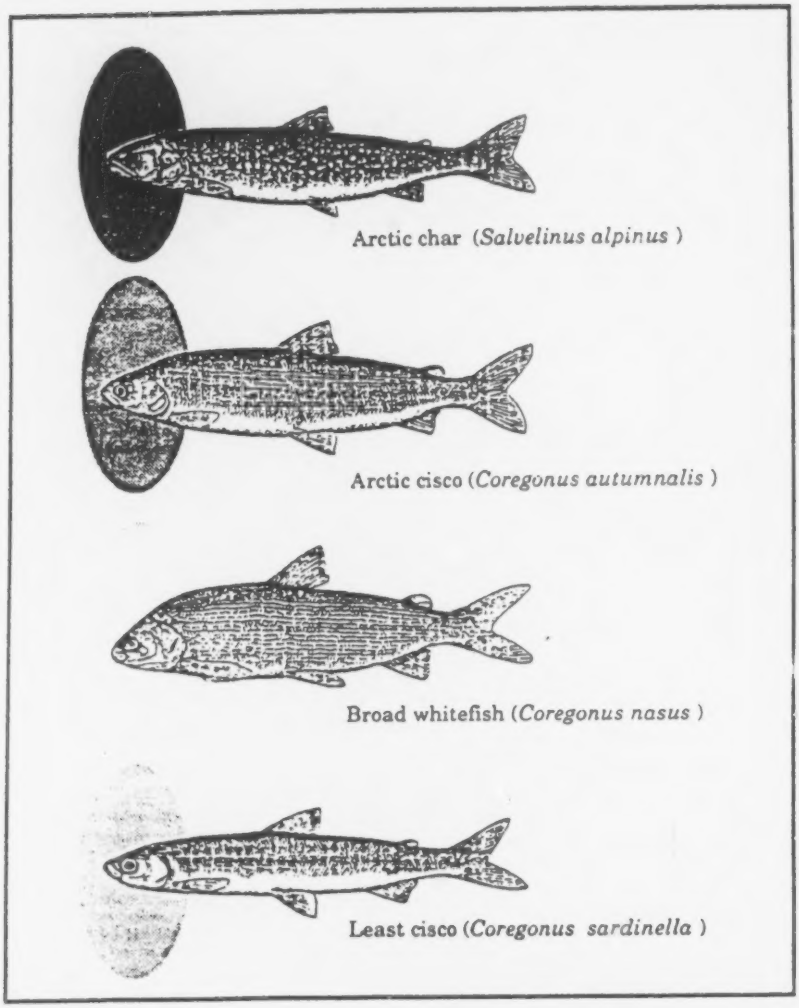

Arctic char (*Salvelinus alpinus*)
Arctic cisco (*Coregonus autumnalis*)
Broad whitefish (*Coregonus nasus*)
Least cisco (*Coregonus sardinella*)

Figure 2: Anadromous fish species of primary concern in the central Beaufort Sea. Fish are listed in descending order according to their relative importance. Shaded areas indicate the relative tolerance of the fish to high salinity (25 ppt) and cold temperatures (5°C) with tolerance increasing with the darkness of the shading. (*Fish figures adapted from J.D. McPhail and C.C. Lindsey 1970. Freshwater fishes of northwestern Canada and Alaska. Fish. Res. Bd. Can. Bull. 173*).

subsistence economies of the region, and they are vulnerable to the type of perturbations that have been associated with causeways. . .

Arctic cisco: in the central Beaufort Sea, this species is represented by migrants from the MacKenzie River system in the Canadian Northwest Territories. At Age 0 or Age 1, Arctic cisco from the MacKenzie River disperse along the Beaufort Sea coast with very large numbers of the Beaufort Sea population entering Alaskan waters (although the numbers are largely speculative, 20 to 40 percent of the MacKenzie stock of Arctic cisco are estimated to migrate to Alaska).

Once in Alaskan waters, Arctic cisco migrate to the Colville River delta where they overwinter each year until they reach maturity. For seven to nine summers, these fish disperse along the coast to forage from western Harrison Bay to the Sag River delta, returning to the Colville River in the fall to overwinter. During the summer, Arctic cisco forage in the relatively warm (4-8°C) brackish (4-14 ppt) waters along the coastline, in open lagoons, and in outer river deltas. After seven to nine years, Arctic cisco migrate back to the MacKenzie River to spawn.

Arctic cisco are harvested in late fall and early winter for subsistence and commercial purposes in the Colville River delta. Natives in the village of Kaktovik on the coast of the Arctic National Wildlife Refuge harvest adult Arctic cisco in late summer and early fall. Similarly, six native villages in the MacKenzie River drainage harvest Arctic cisco migrating to spawning areas in the late summer and early fall. Because of their subsistence value and migratory habits which make them vulnerable to industrial development along the entire coast of the Beaufort Sea, Arctic cisco have received particular emphasis in monitoring studies and other biological investigations in the central Beaufort Sea.

Arctic char: in the Beaufort Sea, the distribution of this species is limited by the availability of fast-flowing mountain streams with large, perennial springs. Consequently, Arctic char are absent from the tundra streams west of the Colville River. Eleven Alaskan rivers and streams between the Colville River and the Canadian border support Arctic char with each river supporting a discrete population.

The anadromous form of Arctic char is considered the most euryhaline of anadromous fish species in the Beaufort Sea. However, it is relatively intolerant of marine salinities (32 ppt) and tends to forage in relatively warm (2-10°C) moderate salinity waters (8-25 ppt) along the coast, in lagoons, and along barrier islands.

Arctic char first migrate to sea when they are about 150 mm in length (approximately Age 3) and will make annual migrations until maturity (approximately Age 7). Adult Arctic char migrate to sea on alternate years, remaining in freshwater during the year prior to spawning. Although capable of repeat spawning, two to three years are necessary for adult Arctic char to recover from the energy expenditure of spawning and begin developing gonads again.

Arctic char are harvested in the fall for subsistence purposes by natives in two villages in Alaska and two villages in Canada. Arctic char are a prized species targeted by sport fishermen along the Beaufort Sea coast from Harrison Bay to Hudson Bay.

Broad whitefish: this species is found in larger tundra and mountain rivers across the Beaufort Sea from Point Barrow to Amundsen Gulf. Most broad whitefish populations in this region are discrete and somewhat localized although some exchange between populations has been reported.

Broad whitefish are the least euryhaline of the four anadromous species which are common in the central Beaufort Sea. Although they appear to be able to tolerate salinities up to 15 ppt, broad whitefish are generally associated with the deltas of larger rivers and streams where freshwater discharges moderate temperature and salinity conditions typically found in coastal water.

Broad whitefish are a preferred food source in most villages on the Beaufort Sea coast. They are taken in fall and winter subsistence fisheries by villagers from Atqasuk, Barrow, Kaktovik and Nuiqust in Alaska. In Canada, they are taken in subsistence fisheries in six villages in the MacKenzie River drainage. In addition, broad whitefish are harvested in the late fall fishery in the Colville River delta.

Least cisco: this species is represented in the Beaufort Sea by both anadromous and freshwater populations. Freshwater populations are common in tundra lakes and streams across the Arctic coastal plain while anadromous populations are common from the Colville River west and in the Canadian Arctic. Both anadromous and freshwater populations appear to be absent from the central Beaufort Sea between the Colville River and the border with Canada. In the central Beaufort Sea, least cisco are members of the Colville River population which disperses from western Harrison Bay to the Sag River.

Anadromous least cisco are more intolerant of high salinities than either Artic char and Arctic cisco, but are more tolerant than broad whitefish. This species also appears to derive the least benefit from anadromy as evidenced by the lower fitness of anadromous individuals when compared with those that remain in freshwater to feed.

Although least cisco are not preferred by native populations, they are harvested in fall subsistence fisheries in the Colville River and the Canadian villages of Aklavik and Tuktoyaktuk. The commercial fishery on the Colville River also harvests least cisco.

Beaufort Sea Causeways

The West Dock Causeway

The 14,400-foot long West Dock causeway is located on the western edge of Prudhoe Bay (Figure 1) and was constructed in several stages. The initial 4,400 feet of the causeway were constructed in 1975 to provide docking facilities for barges carrying equipment to be used in the construction of the Trans-Alaska Pipeline (Figure 3d). In the following year, severe ice conditions in the Prudhoe Bay region kept supply barges from reaching the dock constructed the previous year. In order to reach them, West Dock was "temporarily" extended another 5,000 feet as an emergency measure (Figure 3c).

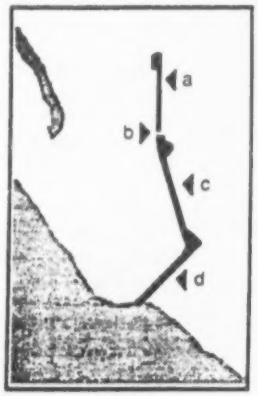


Figure 3. The West Dock causeway. a. the Waterflood extension constructed in 1980; b. the 50-foot breach; c. the emergency extension constructed in 1976; d. the original West Dock .

The "Waterflood" extension to West Dock was constructed in 1980 to reach depths in which seawater would be available throughout the year; this water would be used to "flood" the Prudhoe Bay petroleum reservoir in order to maintain pressure. To reach the required depths, an additional 5,300 foot extension to the existing West Dock was constructed in 1980 (Figure 3a).

The "Waterflood" extension is separated from the first two legs of West Dock by a 50-foot wide breach (Figure 3b). The breach was constructed to allow anadromous fish to pass through the West Dock causeway instead of having to swim around the structure.

The Endicott Causeway

Construction on the Endicott causeway began in the winter of 1985 and was completed during 1987. The Endicott Project resulted in the construction of two causeways: one which connects two offshore drilling islands (inter-island causeway) and another which connects the inter-island causeway to shore (Figure 4b). The inter-island causeway is approximately 16,300 feet in length and up to 400 feet wide with a gravel drilling island at either end. The western drilling island (Figure 4a) is the main production island for the Endicott Project and incorporates a waterflood facility. The eastern drilling island (Figure 4c) is called the satellite drilling island and incorporates a small dock for off-loading equipment.

The causeway that connects the inter-island causeway to shore is approximately 10,000 feet in length (Figure 4e). Two breaches were incorporated into the latter causeway to facilitate fish passage: one 500-feet wide and a second 200-feet wide (Figure 4c and 4f). Both breaches were placed in water depths which would ensure fish could pass through the causeway during low water periods.

Figure 4. The Endicott causeway. a. the Main Production Island; b. the inter-island causeway; c. the satellite drilling island; d. 200-foot breach; e. the island-to-shore causeway; f. 500-foot breach.

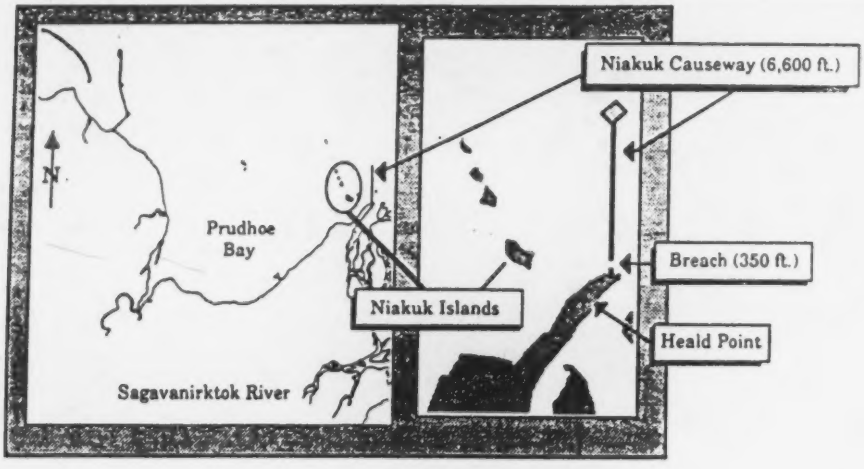
Lisburne and Niakuk Causeways

A third causeway had been proposed for construction in the center of Prudhoe Bay in association with the Lisburne Development Project. As proposed, the Lisburne causeway would have been approximately 13,400 feet long and 282 feet

wide at the base. In January, 1988, the Atlantic Richfield Company of Alaska (ARCO) concluded directional drilling from shore was an economically viable alternative to causeway construction and withdrew permit applications for the Lisburne causeway.

In the fall of 1987, Standard Alaska Petroleum Company (SAPC) announced their Niakuk Development Project. As currently proposed, this project would require construction of a 6,600-foot long causeway at Heald Point (Figure 5) to connect an offshore drilling island with the Prudhoe Bay infrastructure. One alternative to the proposed causeway would include a 350-foot breach to mitigate fishery concerns. Environmental assessments prepared for the Niakuk Development Project by SAPC are currently undergoing review by federal, state, and municipal agencies in Alaska.

Figure 5. The proposed Niakuk Development Project.



Environmental Effects of Causeways

When permits for the West Dock causeway—and its subsequent extensions—were originally reviewed, environmental concerns focused on the potential effects of the causeway on the migrations of anadromous fish along the coast. At that time, anadromous fish were generally believed to utilize a 300-foot wide band of low salinity water found immediately adjacent to the Beaufort Sea coast. By intersecting this band of water, causeways would physically block the movement of anadromous fish along the coast.

Since 1981, however, intensive monitoring of the coastal environment has improved the general understanding of the relationship between coastal oceanography and the distribution of anadromous fish. The knowledge gained through these monitoring programs has allowed more precise definition of the mechanisms by which causeways affect anadromous fish. With this understanding it has been possible to reconstruct pre-causeway oceanographic and biological conditions from the meager empirical data available. When these reconstructed pre-causeway conditions are compared with current conditions, many of the environmental effects predicted by resources agencies can be shown to have already occurred.

Prior to the construction of West Dock, water masses originating in the MacKenzie River delta and sustained by rivers along the Alaskan coast were tranported into the central Beaufort Sea by longshore transport (Figure 6). In the Sag River delta high temperature (8-12°C), fresh water mixed with the coastal water masses, increasing their temperature and decreasing their salinity. This band of brackish water was transported west into Prudhoe Bay, Stump Island lagoon, and Simpson lagoon. In Gywdyr Bay, freshwater from the Kuparuk River would further moderate the temperature and salinity of this brackish water mass. Wind driven mixing of this brackish water mass with marine water at the seaward edge of Stump Island and Simpson lagoons would continually replenish supplies of epibenthic prey organisms.

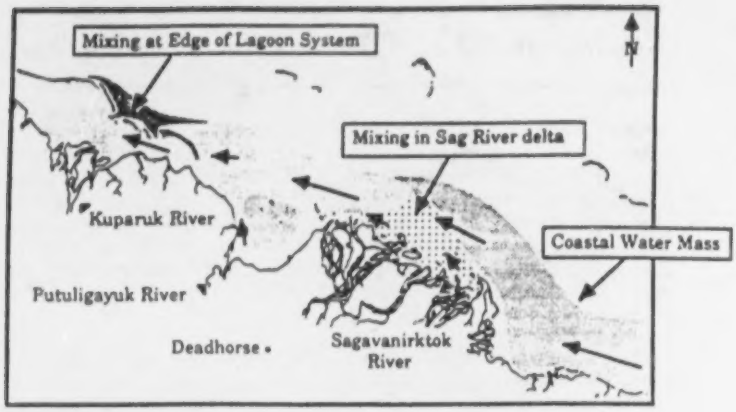


Figure 6. A reconstruction of oceanographic conditions as they existed in the central Beaufort Sea prior to the construction of causeways (see discussion in text).

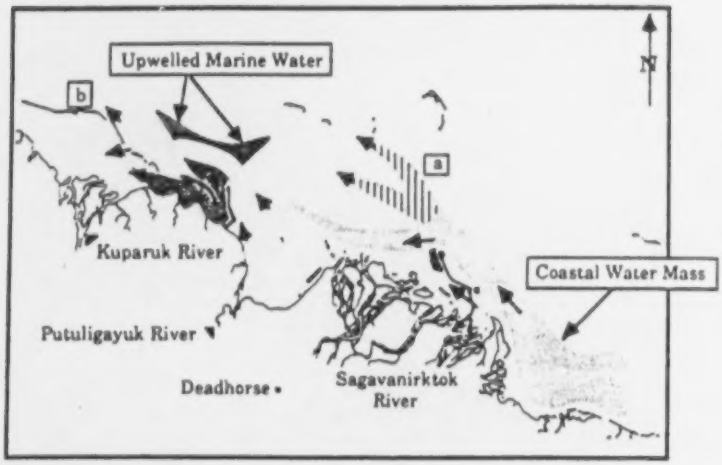


Figure 7. Oceanographic conditions as they currently exist with both the West Dock and Endicott Causeways in place. Brackish coastal water masses from the east and freshwater from the east channel of the Sag River are diverted offshore by the Endicott causeway (a). Water from the coastal water mass mixes with fresh water in the Sag River delta, is transported across Prudhoe Bay, and is diverted by the West Dock causeway (b). Marine water upwells into Stump Island lagoon to replace the diverted water (see discussion in text).

The construction and subsequent extension of the West Dock causeway, diverted this coastal water mass offshore, outside of Stump Island (Figure 7). Offshore displacement of the coastal water mass caused marine water to upwell into Stump Island lagoon along the west side of the West Dock causeway and into central Prudhoe Bay. Under prevailing wind conditions, this high salinity (28-33 ppt), low temperature (0-3°C) water would dominate the area from West Dock to Gwydyr Bay. Storm events or strong winds from the west would bring water originating from the Colville River and return the lagoon system to brackish water conditions.

The Endicott causeway exacerbated the problems created by West Dock by diverting the coastal water mass and water from the eastern channel of the Sag River (Figure 7). Through mechanisms similar to those observed at West Dock, marine water upwells on the west side of the Endicott causeway in response to the displacement of these water masses. Once there, the presence of the causeway inhibits mixing by prevailing winds, resulting in highly stratified water (a layer of water from the Sag River resting on a layer of marine water) in depths as shallow as three feet.

Although the two breaches included in the Endicott causeway were intended to ensure that problems associated with West Dock were not repeated, they had problems of their own. Both breaches were too small to pass the volumes of water moving against the Endicott causeway and created a bottleneck. In 1986, water velocities through the breaches scoured the bottoms of the breaches to depths 27 feet below what they had been prior to causeway construction. The scouring became deep enough to threaten the structural integrity of the causeway itself and emergency measures were undertaken to stabilize and armor the bottoms of both breaches.

As a result of these oceanographic changes, anadromous fish migrating from Prudhoe Bay into Stump Island lagoon would encounter the sharp salinity/temperature gradient assocciated with West Dock and not go further. Fish migrating from the Colville River toward Prudhoe Bay would encounter the gradient at the eastern edge of the Kuparuk River delta and not proceed. As described above, some wind conditions return the coastal system to brackish water conditions and prevented West Dock from becoming a persis-

tent and absolute oceanographic barrier to anadromous fish migrations along the Beaufort Sea coast.

Since the construction of West Dock, the distribution patterns of several anadromous fish species has changed significantly. The abundance of least cisco, which were the most numerous anadromous fish species in Prudhoe Bay prior to the construction of West Dock, dropped considerably in Prudhoe Bay. Arctic cisco, which were low in abundance in pre-West Dock surveys, became the most abundant anadromous fish in the region; disruption of their migration to the Colville River from Canada has been suggested as the reason for this change. Broad whitefish from the Sag River, which used to be abundant in Stump Island and Simpson lagoons, are now found almost exclusively in the Prudhoe Bay region.

Endicott has had similar effects on anadromous fish in the central Beaufort Sea. Since 1985, fall migrations of Arctic char into the Sag River no longer use the eastern channels of the river. This appears to result from the discontinuities the causeway has created in the coastal environment and could seriously constrain the char's ability to reach their traditional overwintering areas.

In addition, the westward migration of Arctic cisco migrating from Canada is impeded at both the Endicott and the West Dock causeways. These juveniles appear to overwintering in the Sag River delta in increasing numbers rather than continuing west to traditional overwintering areas in the Colville River. The result of this shift in overwintering grounds to Arctic cisco could be greatly increased overwintering mortalities since the carrying capacity of overwintering pools in the Sag River is far below the number of migrating Arctic cisco.

In 1987, results from commercial and subsistence harvests in the Colville River increased concerns about the effects of the causeways on recruitment into those fisheries. Prior to the construction of the causeways in the central Beaufort Sea, Age 6-7 Arctic cisco dominated Colville River harvests. In recent years, the number Age 6 fish began to decline and older fish began to dominate the harvests. In 1987, Age 9 fish dominated Arctic cisco catches in the Colville River. Attempts to locate smaller fish (Age 2-6) in the Colville River delta were unsuccessful despite empirical evidence that

large numbers had migrated from Canada and had at least reached the Sag River delta.

Finally, the effect of these causeways on the foraging habitat of anadromous fish in the central Beaufort Sea has been equally significant. Access to high quality foraging areas in coastal lagoons west of the West Dock causeway has been significantly reduced for large portions of the summer because of the oceanographic changes associated with the causeway. For large portions of the open-water period, Stump Island lagoon has been eliminated as valuable foraging habitat for anadromous fish. Marine intrusions into Prudhoe Bay and the Sag River delta has reduced the quality of the foraging habitat remaining to fish impeded by West Dock.

The effects of the loss and degradation of this habitat on fish species in the Beaufort Sea cannot be underestimated. As stated in the introduction, the energy anadromous fish obtain in the summer must support them for the next nine to ten months. It provides the basis for their growth, their ability to reproduce, and their ability to survive the overwintering period. Significant losses in their annual energy budgets would increase overwintering mortalities, increase the age at which they mature, increase the interval between spawnings, and decrease their fecundity. Any one of these outcomes would seriously affect the populations of these animals.

Conclusions

In a May 5, 1988, letter to federal resource agencies, the District Engineer of the Alaska District, Corps of Engineers, stated that the Endicott causeway has resulted in significant adverse environmental effects. In that letter, the Corps recognized the need to identify measures that would mitigate the environmental effects of the Endicott causeway. To assist in this determination, the Corps has convened an advisory group made up of representatives from state and federal resource agencies. The Corps wants to complete mitigation plans for the Endicott causeway before the end of this calendar year.

The Corps' action suggests that potential impacts to anadromous fish will have to be considered more seriously in the design of future causeways than they have been in the past. In order to do so, alternatives to solid-fill gravel causeways which avoid potential disruptions to the oceanography of the Beaufort Sea coast will have to be given more extensive evaluation.

In the past, the Alaska petroleum industry has resisted alternatives to gravel causeways. Several alternatives to the Waterflood extension of West Dock were developed during regulatory review of that project. An additional set of alternatives was developed during the regulatory review of the Endicott Development Project. With both projects, measures that would have more effectively mitigated environmental impacts were rejected in favor of protracted environmental monitoring.More recently, Standard Alaska Production Company submitted a proposal for a third causeway in the central Beaufort Sea in association with the Niakuk Development Project.

There are indications that this resistance in the Alaskan petroleum industry may change. In January of this year, ARCO Alaska Petroleum Company withdrew their applications for a permit to construct a 13,400 foot-long causeway in central Prudhoe Bay. Instead, they chose to develop the Lisburne reservoir using directional drilling technology. In addition, the Canadian oil and gas industry plans to use subsea pipelines which would obviate the need for gravel causeways when they develop petroleum reservoirs in the MacKenzie River delta.

Projects such as these demonstrate that alternatives to solid-fill gravel causeways can be used for petroleum development on the Beaufort Sea coast. If used in future projects, they will ensure that oil and gas development in coastal waters of the Alaskan Beaufort Sea will be compatible with conservation of Arctic anadromous fishery resources.

Mar. 8 '89 17:19 0000 NRDC TEL 212-370-7656

Natural Resources
Defense Council

[illegible]

March 8, 1989

Mr. Tom Williams
Committee on Energy &
Natural Resources
U.S. Senate
Washington, D.C. 20510

By Facsimile

Dear Mr. Williams:

Thank you for the opportunity to appear at Monday's hearing on S.406. Below are responses to questions posed by Chairman Johnston and Senator McClure at the hearing and to written follow-up questions from Senator Wirth.

A. Question from Chairman Johnston (to Brooks Yaeger):

Q: Should new information on underground injection of muds and cuttings allay our fears?

A: Regarding the safety of underground injection, very little is known about the ultimate behavior and fate of injected materials on the North Slope. Once injected, wastes are irretrievably removed from control and management, and their migration within the subsurface crust or to groundwater or surface water cannot be accurately monitored. Serious pollution problems have occurred in many states where underground injection is practiced. No one has ever examined the fate of the 4.2 billion gallons of industrial waste that have been injected at Prudhoe to determine whether wastes have been contained in the confining layer or have migrated.

The 1002 report notes that permafrost in the 1002 area is much thinner than it is near Prudhoe and that the permafrost in the 1002 area is discontinuous in areas of surface water. It is therefore not clear that adequate confinement of injected wastes could be assured in the 1002 area. Migration of injected wastes is of particular concern in the 1002 area because fish and wildlife use freshwater sources derived from underground springs.

ARCO Alaska, Inc. has been experimenting with augur holes, or "vertical reserve pits" for drilling waste disposal. Information is not yet available about whether these pits prevent migration of wastes to the surrounding tundra environment. It is worth noting that augur holes and other disposal methods that rely on freeze-back to contain wastes assume a stable permafrost. The potential effects of global warming on permafrost have yet to

be factored into evaluations of these disposal techniques, to our knowledge.

With respect to existing practices, it should be noted that:

a) it is our understanding that ARCO is still proposing and building reserve pits for its new production drill sites at Kuparuk;

b) ARCO has also asked EPA for an NPDES permit to resume its practice of dumping untreated reserve pit waters on roads in the Prudhoe area (letter to EPA from ARCO dated 10/4/88);

c) while many existing reserve pits were dewatered last year, most have yet to be closed out and continue to be a potential source of contamination;

d) the effectiveness of close-out methods for both production and exploratory reserve pits is still being studied, and it is not yet assured that this can be done in a manner that prevents future leaching of materials to the tundra, wetlands and

e) for wells drilled by BP Exploration in [illegible] field, and for all North Slope offshore explorat[illegible] and cuttings are still dumped untreated into the [illegible] sea [illegible] the impacts to the marine environment and organisms [illegible] adequately assessed. The results of studies by the [illegible] Wildlife Service on contaminants in the marine env[illegible] have not yet been considered in this debate should [illegible]

B. Questions from Senator Wirth

Q: In responding to questions, Senator Lujan noted that he would have authority under S.406 to cancel any lease which caused an environmental problem. Does the Governor of Alaska have power to cancel leases at Prudhoe Bay? Assuming the Governor had such power, would that enable him to effectively stop the kind of alleged violations referred to in the EPA draft report referred to in the New York Times of March 5, 1989?

A: According to ADEC, the Governor of Alaska has the power to cancel leases at Prudhoe Bay. However, this authority has clearly not prevented the kind of alleged violations referred to in the New York Times article and discussed at length in the EPA report and in Oil In the Arctic.

Q: Would it enable the Secretary to have prevented the additional impacts (above those predicted prior to construction) which the Fish and Wildlife Service identified as having taken place in the development of the Prudhoe Bay fields?

A: Authority to cancel leases such as that provided in S.406 would not enable the Secretary to prevent impacts such as those identified by FWS for three reasons.

First, Section 209 of S.406 restricts the Secretary's ability to cancel a lease for environmental reasons to situations where "the likelihood of a significant adverse effect will not disappear or the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable period of time." This restriction is so difficult to satisfy that leases could rarely if ever be cancelled for environmental reasons. This provision was modeled after a similar provision in Section 5(a)(2) of the Outer Continental Shelf Lands Act (OCSLA). To our knowledge no leases have ever been revoked under OCSLA for any reason, environmental or otherwise.

Second, even under less restrictive authority to cancel a lease, lease cancellation would likely only occur <u>after</u> major environmental damage had already occurred, not before. This is due to the tremendous financial liability that lease cancellation creates for the federal government under S.406. The government will not be eager to incur such a liability unless major impacts justify it.

Finally, lease cancellation authority will not address the cumulative impacts of oil field development. The cumulative effects of drill pads, roads, reserve pits, processing facilities, pipelines, helicopter and vehicle traffic, marine facilities, waste facilities, etc., would not be lessened appreciably unless most or all leases were cancelled and the area restored.

C. <u>Question from Senator McClure</u>

Q: Was the EPA report on causeways prepared before or after breaches were put in existing causeways at Prudhoe Bay?

Short A: After.

Long A: Anadromous fish in the Beaufort Sea provide an important resource for subsistence users in Alaska and Canada. Native residents throughout the Mackenzie River region in Canada

(National Marine Fisheries Service 1987), and in Kaktovik and Nuiqsut in Alaska (Jacobson and Wentworth 1982) depend heavily on the fishery resources. The only commercial fish operation in the Alaskan Beaufort Sea is conducted at the Colville River delta. The primary anadromous fish species in the Beaufort Sea include Arctic char, Arctic cisco, least cisco, and broad whitefish. Arctic cisco are an international fishery resource which migrate as juveniles from spawning grounds in the Mackenzie River through nearshore habitats along the Arctic Refuge, past Prudhoe Bay to areas near the Colville River.

These fish travel in the immediate nearshore zone where warmer, brackish waters prevail (EPA 1988). It is in this nearshore zone where two gravel causeways have been constructed to support oil operations in the Prudhoe Bay region. These causeways have been found to be causing serious impacts based on post-construction monitoring required by the Corps of Engineers, despite existing breaches. For example, in May of 1988, the Corps of Engineers concluded that "unacceptable environmental impacts to the fisheries habitat have resulted from the Endicott causeway." Letter from Wilbur T. Gregory, Alaska District Engineer, to Robert McVey, National Marine Fisheries Service, dated May 5, 1988. In October of 1988, EPA concluded that causeways have degraded water quality and habitat in the Beaufort Sea, which in turn:

> ... place populations of anadromous fish, and the commercial and subsistence fisheries that rely upon them, at substantial risk. Indicators from causeway monitoring programs show that fish are being affected by these habitat changes; and it is possible that significant population declines have already begun to occur. U.S.EPA, 1988. Causeways in the Alaskan Beaufort Sea, EPA, Region 10, October 1988. (emphasis added).

Additional mitigation is now being considered, but it has not yet been done. No new breaches have been constructed in either causeway since the EPA report was published in October, 1988.

I have attached the executive summary of EPA's report on causeways for the record; we recommend that the entire report be made part of the hearing record.

As a final note, it is my understanding that the Committee was given the draft EPA report on oil waste disposal practices on the North Slope, along with accompanying slides and videos. It is my understanding that the slides were not accompanied by a

log. Attached for the record is the log prepared by EPA explaining what the slides actually show.

Once again, thank you for the opportunity to present views.

Sincerely,

Lisa Speer
Senior Staff Scientist

LS:ag
Encl.

LOG OF SLIDES FROM EPA'S BRIEFING OF THE
AMERICAN PETROLEUM INSTITUTE, FALL 1988

2.60 Alaska North Slope Operations

2.61 ARCO, Pad H, unlined flare pit. ADEC is performing extensive sampling in the summer of 1988 to investigate allegations of dumping of wastes into flare pits North Slope, Alaska, June 1988.

2.62 ARCO, Pad H, lined pigging pit, North Slope, Alaska, June 1988.

2.63 Standard, Pad J, disposal of wastes inside reserve pit, North Slope, Alaska, June 1988.

2.64 Standard, Pad J, disposal of waste inside reserve pit, North Slope, Alaska, June 1988.

2.65 Standard, Pad J, leakage of oily waste from reserve pit. Note tundra kill. North Slope, Alaska, June 1988.

2.66 Standard, Pad Y, disposal of oily wastes inside reserve pit during developmental drilling, North Slope, Alaska, June 1988.

2.67 Peak service company pad, storage of wastes and raw materials including solvents, lubricating oils, methanol, corrosion inhibitors, glycols, biocides, without secondary containment. Damaged drums and spillage were evident. Deadhorse, Alaska, June 1988.

2.68 Garbage piles, industrial wastes, and unpermitted incinerator behind Deadhorse Hotel. Spillage on pad was evident. Deadhorse, Alaska, June 1988.

2.69 (Same) Close up of leaking drum and garbage behind Deadhorse Hotel. Spillage on pad was evident. Deadhorse, Alaska, June 1988.

2.70 Dowell Schlumberger Pad, discharge of unknown oily waste onto tundra, Deadhorse, Alaska, June 1988.

2.71 Unreported spill from the Nabors service company pad used by Dowell-Schlumberger. Tundra mat was saturated with what appeared to be diesel fuel. Spill resulted in a Notice of Violation issued by the Alaska DEC. Deadhorse, Alaska, June 1988.

2.72 Same, note dead tundra.

2.73 Same, note dead tundra.

2.74 At another corner of the Dowell-Schlumberger pad, approximately 50 drums of unknown chemicals, some were damaged and leaking, strong chemical odor was evident. Deadhorse, Alaska, June 1988.

2.75 (Same) Spillage of unknown chemicals onto tundra.

2.76 Oxbow Municipal Landfill, divided into two sections; one for municipal and industrial waste and one for oily wastes. Photo shows municipal section with seagulls congregating on incinerator ash. Operated by the North Slope Borough. North Slope Alaska, June 1988.

2.77 (Same) Oily wastes pit, no analysis of waste is required prior to acceptance. Pit is nearing capacity. It was opened in 1987 and was supposed to last for 15 years.

2.78 (Same) Municipal section. Water from snow melt has historically been a major problem in this landfill.

2.79 B.J. Titan Oilfield Service, used drums, some leaking unknown white substance onto the pad. Deadhorse, Alaska, June 1988.

2.80 Aurora North Fuels, used drums, machinery and debris. Spillage of oil and other unknown substances were evident.

3.1 Large area of oil spillage on a section of the Deadhorse Hotel pad. Note futile attempt to collect spillage with absorbent pad. Deadhorse, Alaska, June 1988.

3.2 Forward Alaska pad. Damaged drums of methylene chloride, and used batteries stored without secondary containment near municipal water supply. Deadhorse, Alaska, June 1988.

3.3 Hundreds of used drums stored in water on the Forward Alaska Pad allowing the potential migration of contaminants onto the nearby tundra. Deadhorse, Alaska, June 1988.

3.4 Childs Pad. Salvage drums containing liquid wastes awaiting disposal in an area provided with secondary containment. ARCO and Standard paid for site cleanup and remediation after Childs went bankrupt. No chemical analysis of the wastes has been performed, although State claims that they are "nonhazardous." Deadhorse, Alaska, June 1988.

3.5 Standard, Santa Fe Pad, employees vacuuming contents from used oil field chemical drum at Standard's used drum facility. Spillage and floor washdown are drained onto pad. Drums are rinsed and crushed. Rinsate and drum bottoms are injected at ARCO Pad 3 waste facility and crushed drums are

landfilled at Oxbow Landfill.

3.6 Veco service company. Spillage of oily waste beneath the structure. Although notified of problem by Alaska DEC numerous instances. Veco has not complied. Deadhorse, Alaska, June 1988.

3.7 ARCO pad 3 waste pit. Fluids are injected via injection well. Accepts all oilfield wastes, requires simple manifest with source and quantity of waste prior to acceptance. At the time of the site visit, the liner around pit showed tears and cracks. No leak detection system is employed. North Slope Alaska, June 1988.

3.8 Standard Endicott facility, NPDES permitted discharge of drilling muds and drilling fluids into Arctic Ocean. Endicott Offshore, North Slope Alaska, June 1988.

3.9 Oily deposit are around the perimeter of a North Slope reserve pit. North Slope Alaska, September 1987.

3.10 Leakage from reserve pits resulting in tundra kill. North Slope Alaska, September 1987.

3.11 (Same) Close up of oil sheen on tundra from reserve pit leakage. North Slope Alaska, September 1987.

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EPA 910/9-88-218

United States Environmental Protection Agency
Region 10
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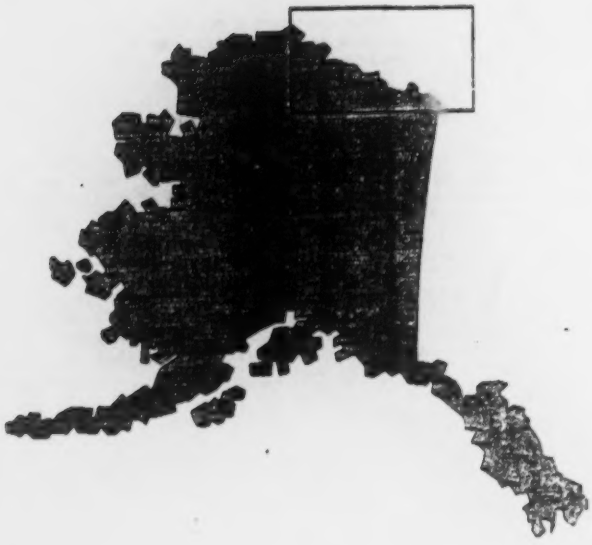
Seattle, WA 98101
October 1988

Alaska Operations Office - Anchorage

EPA

Causeways in the Alaskan Beaufort Sea



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Causeways in the Alaskan Beaufort Sea

5. Report Date: October, 1988

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13. Type of Report & Period Covered: Final Report

Supplementary Notes

Abstract (Limit: 200 words)

This report reviews information from several years of permit-required field monitoring of the physical and biological effects of solid-fill gravel causeways in the Beaufort Sea near Prudhoe Bay, Alaska. The shallow nearshore zone of the Beaufort Sea coast in the Prudhoe Bay area functions biologically as an estuary. Area anadromous fish rely nearly upon the comparatively moderate estuarine conditions in this zone. This zone represents critical rearing habitat for the anadromous fish, as 90 percent or more of their feeding for the entire year occurs here during an 8 to 12 week ice-free summer season. Prudhoe Bay area causeways have been constructed across this critical zone, degrading the nearshore estuarine environment by: 1) deflecting fresh and brackish water masses offshore resulting in the loss of thermal energy and freshwater from the nearshore; 2) causing enhanced upwelling and intrusion of marine water directly into the nearshore zone; 3) replacement of the deflected estuarine water; and 3) affecting local ice dynamics. Overall, fundamental alterations in nearshore water quality and circulation patterns have occurred along as much as 65 kilometers of coastline. These physical effects increase the risks that populations of anadromous fish will be seriously affected by increased overwinter mortalities, reduced growth and fecundity, and/or delayed maturation. Evidence that these impacts may already have begun to occur is discussed. Construction of additional causeways in the area would further increase these risks.

17. Document Analysis a. Descriptors

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Many people contributed their time, advice, and expertise to this document. Helpful comments about technical content were made by several reviewers, too numerous to list here. The efforts of each are greatly appreciated. Linda Sewright's technical editing skills were particularly helpful in making complicated topics as understandable as possible. Finally, the graphics and publishing abilities of Eric Meyerson and Christopher Moffett were nothing short of heroic, especially considering the condition of the draft document and the impossible schedule. Grateful acknowledgement is extended to all.

ABSTRACT

Prior to the construction of major gravel causeways in the central Beaufort Sea, the shallow (< 2 m) nearshore environment of the Prudhoe Bay area (including a nearby lagoon system and two river deltas) was dominated in the summer by a band of brackish, relatively warm estuarine water. These estuarine conditions were generally continuous along the nearshore during both east and west winds. Conditions in this band represent the most productive feeding and rearing habitat for the Arctic anadromous fish of the region. During prevailing easterly winds, the West Dock causeway deflects the estuarine water offshore. The deflected water mixes more directly with offshore marine water and rapidly loses its estuarine character. At the same time, the deflected water is replaced by upwelled marine water which then dominates the Stump Island Lagoon-Gwydyr Bay complex. This upwelled water causes a large area to be unsuitable as feeding habitat for many anadromous fish, and severs the nearshore band of estuarine habitat. These alterations to the natural environment cause fish migration to be delayed, and fish to be isolated from unaffected habitat areas to the east and west. Upon shifts to west winds, the marine water upwelled into the lagoon system flows around the causeway into Prudhoe Bay. Instead, anadromous fish rearing there to retreat toward river delta fronts for refuge. The Endicott causeway also deflects the brackish coastal plume offshore. Similar to the West Dock causeway, the Endicott causeway induces upwelling of marine water downwind from the structure. This separates Sagavanirktok River water in the nearshore from the diverted coastal water mass. In this manner, the brackish coastal water mass and the fresh river water each become isolated with marine water. These processes have caused an overall degradation of nearshore estuarine water quality, and hence habitat value. Cumulatively, the West Dock and Endicott causeways have fundamentally altered [illegible] patterns and water quality across approximately 65 kilometers of the central Beaufort Sea coast. These major changes in the physical [illegible] place populations of anadromous fish and the commercial and subsistence fisheries that rely upon them, at substantial risk. Information from causeway monitoring programs show that fish are being affected by these habitat changes. It is possible that significant population declines have already begun to occur.

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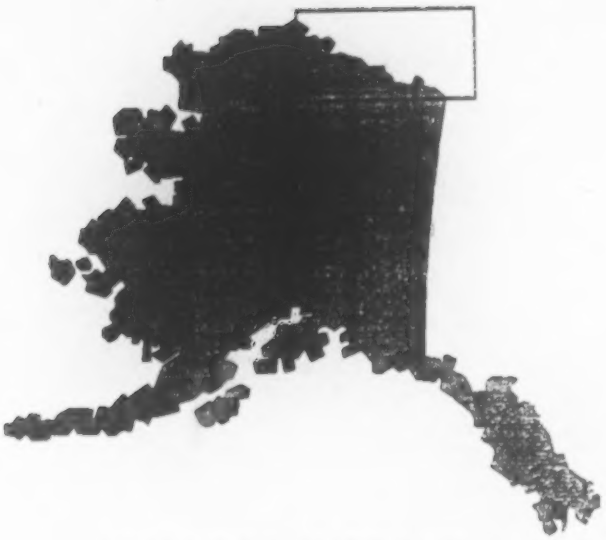

United States Environmental Protection Agency
Region 10

Causeways in the Alaskan Beaufort Sea

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October, 1988

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EXECUTIVE SUMMARY

Overview

The nearshore zone of the Prudhoe Bay area functions biologically as a coastal estuary. The warm, brackish water conditions found across the area are more biologically productive than the fresh or marine waters. Because of this productivity, the area is critical for the anadromous fish of the central Beaufort Sea which are dependent upon estuarine conditions for feeding and rearing. However, despite the productivity of this estuarine habitat, the harshness of the Arctic environment and the short summer season cause these fish populations to be slower growing and maturing than more southern populations.

By disrupting circulation patterns and altering the balance of fresh and marine water, the existing causeways have significantly affected water quality across approximately 65 kilometers of the central Beaufort Sea. The water quality alterations have reduced the quantity and quality of estuarine habitat. These causeway-induced changes decrease the ability of anadromous fish to obtain sufficient energy for overwintering survival, growth, and reproduction. Although the risk of population-level impacts from these changes cannot presently be quantified, several indicators from environmental monitoring programs suggest there is a substantial risk of significant population-level impacts over the life of the causeways. Eventually, existing causeways could seriously disrupt the coastal fish community and harm subsistence and commercial harvests in Canada as well as in Alaska. Restoration of circulation patterns similar to the pre-causeway environment is necessary to reduce the impacts to water quality and fish habitat. In contrast, additional causeways proposed for the area would significantly increase these impacts and risks.

Introduction

Prudhoe Bay is located on the central Beaufort Sea coast approximately halfway between Point Barrow and the Alaska-Canada border. Considerable industrial activity has occurred in the general Prudhoe Bay area, as it is the hub of the largest producing oil field in the United States and the origination point for the 1,300-kilometer long Trans Alaska Pipeline System. This industrial activity has spread into nearby offshore waters as well, and three gravel causeways have been constructed in the area. Two of these - the West Dock causeway and the Endicott causeway - extend four kilometers or more from shore and have been the subject of considerable controversy both prior to and since their construction.

The primary concerns about the gravel structures are their impacts to nearshore water quality and circulation patterns, and, consequently, the quality of habitat for the anadromous fish populations of the region. These fish are an important resource for subsistence users in both Alaska and Canada. During the brief summer period when the Beaufort Sea is not frozen, these fish are generally constrained to the inner nearshore zone where inhospitable marine conditions are displaced by warmer, brackish waters. It is across this same critical nearshore zone that the causeways have been constructed, disrupting nearshore circulation patterns and causing the estuarine habitat to be replaced by offshore marine water along many kilometers of coastline.

The impacts and risks posed by Prudhoe Bay causeways are significant. The Alaska District, U.S. Army Corps of Engineers, has evaluated the impacts of the Endicott causeway as acceptable and is considering mitigation measures. This report has been prepared as a basis of support for decisions about mitigation at both the Endicott and West Dock causeways. The report summarizes the current state of knowledge about the nearshore environment and the impacts of causeways in the central Beaufort Sea.

Environmental Setting

For 1 to 8 kilometers out from shore in the Prudhoe Bay area, the Beaufort Sea is extremely shallow - less than 2 meters deep. This includes the broad Sagavanirktok River delta and the coastal lagoon system to the west. During the winter, these areas freeze completely to the bottom and cannot serve as feeding and rearing habitat for anadromous fish for about nine months. Open surface water is found only during a few months in the summer. Due to the extreme shallowness of the nearshore, summer water currents are determined by the wind. The direction of the current, in turn, plays a large role in determining water quality in the area.

During summer, warm, fresh water from rivers in Canada and Alaska mixes with cold, saline marine water to form a nearshore band of brackish water, the "coastal water mass." This mass of brackish water flows east or west along the Beaufort Sea shoreline depending on the direction of the prevailing winds. The Sagavanirktok River is a major local source of fresh water input to the coastal water mass, maintaining and enhancing the estuarine habitat of the Prudhoe Bay area.

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Satellite images and hydrographic surveys provide evidence that prior to the construction of the causeways, the nearshore's estuarine conditions were generally continuous across the Prudhoe Bay area. Although the coastal water mass behaved somewhat differently under easterly versus westerly winds, the integrity of the estuarine band could be maintained in either case.

Biologically, this nearshore estuarine zone is the most critical feature of the summer coastal aquatic environment. Here, the harsh conditions of the Arctic Ocean - inhospitable for many organisms - are moderated by a combination of increased solar warming (due to shallowness), lower salinities, and terrestrial as well as marine nutrient sources. Productivity in this zone is higher for phytoplankton, aquatic plants, invertebrates, and fish than it is in adjacent marine or freshwater environments. The anadromous fish of the region are particularly dependent upon these more moderate and productive estuarine conditions.

Numerically dominant anadromous fish species in the Beaufort Sea include Arctic cisco, least cisco, broad whitefish, and Arctic char. These fish support subsistence fisheries in both the United States and Canada, and play an ongoing role in the native cultures of the American Arctic. Arctic cisco in particular are an international resource, with the individuals from the same population being harvested in both the Alaskan Beaufort Sea and throughout the Mackenzie River drainage in Canada. All of the anadromous fish must obtain the vast majority (90 percent or more) of their energy intake for the entire year during the very limited period of open water. The feeding and rearing period is so limited (approximately 10 weeks) that these populations naturally grow and mature more slowly than related populations and species from more temperate areas. In addition, the ability to acquire energy rapidly is so limited that these fish are unable to spawn in consecutive years. Even though food organisms may be abundant, energy is clearly a limiting factor.

Temperature and salinity are extremely important in determining the overall quality of habitat for these fish. Typical marine conditions in the Arctic are extreme - a combination of both very cold temperatures and high salinities. These conditions are energetically adverse and generally represent unsuitable habitat conditions. The amount of time that suitable temperature and salinity conditions are available for rearing is of paramount importance. A reduction in the amount of foraging time will affect the scope for growth for that year. "Mild" years, when estuarine conditions persist in the nearshore zone longer than average, can naturally result in higher productivity and greater fish growth overall. Conversely, "harsh" years reduce growth potential because lowered temperatures slow assimilation rates at the same time that higher salinities invoke additional metabolic demands. If conditions are severe, the fish will not be able to accumulate sufficient energy reserves to survive the overwintering period.

In the absence of causeways, estuarine conditions were spread throughout the broad, shallow areas of the central Beaufort Sea including Foggy Island Bay, the Sagavanirktok River delta, Prudhoe Bay, and the lagoon system to the west. In this habitat, fish could presumably feed efficiently, with high assimilation and growth rates, and with a minimum of metabolic cost. This allowed net energy gains to be maximized over the very short summer, which in turn supported normal rates of growth, reproduction, and overwintering survival.

Causeway Projects

Development of oil and gas reserves on Alaska's North Slope has resulted in the construction of two massive, solid-fill gravel causeways into the Beaufort Sea. The West Dock causeway extends approximately 4 kilometers offshore from the northwestern corner of Prudhoe Bay. A single, 76 meter (50-foot) opening or "breach" was constructed in the West Dock causeway in an attempt to allow anadromous fish to pass the structure. The nearly 8 kilometer long Endicott causeway is located in the middle of the Sagavanirktok River delta just east of Prudhoe Bay. It includes a total of 215 meters (700 feet) of breaching that was intended to allow fish passage as well as to mitigate the water quality impacts predicted by the Environmental Impact Statement (EIS) for the project.

Additional causeways have been proposed by the petroleum industry. The Lisburne causeway would have extended over 4 kilometers into the center of Prudhoe Bay to access a proposed drilling island. This proposal was recently withdrawn in favor of directional drilling from shore. The most recent proposal with a causeway is the Liberty project. This proposal includes construction of a 2.2 kilometer long solid-fill causeway from Reindeer Point, at the northeastern end of Prudhoe Bay, to a man-made drilling island.

The primary concerns about these gravel structures center on their impacts on nearshore water circulation patterns, water quality, and consequently, the quality of estuarine habitat for fish populations in the central Beaufort Sea. During the brief summer period when the Beaufort Sea is not frozen, anadromous fish are generally restricted to the immediate coastal or

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animals will die before the next spring. A year in which increased overwintering mortality occurs for some percentage of a population will result in a direct and immediate decline in overall population size by the same percentage. A population could take several decades to recover in numbers even if no similar overwintering mortality events were to occur in subsequent years. Of course, if increased overwinter mortality were to recur during subsequent generations, recovery would not proceed. If such conditions occurred more than once to a single generation, the degree of the resulting population decline would be multiplied. Similar, but less immediate, impacts could also occur if conditions become severe enough to reduce growth without directly increasing overwinter mortality. One such event per generation could reduce fecundity or delay the age at which the fish reach maturity and spawn. Reduced fecundity and delayed maturity would also result in a direct decline in population size.

Monitoring programs have provided evidence that these impacts are already beginning to occur. The indicators include: 1) basic changes in the structure of the nearshore fish community to one dominated by marine and relatively salt-tolerant species, with freshwater species having all but disappeared in the area; 2) reduction in the strength of young age-classes of Sagavanirktok River broad whitefish since 1981; 3) smaller size-at-age for a large cohort of Arctic cisco in the Prudhoe Bay area in 1985, together with evidence that they may not have survived overwintering; and 4) evidence (including stomach sampling) that food organisms are not effectively unlimited.

The proposed Niakuk causeway would exacerbate the impacts and ecological risks posed by the existing causeways. By deflecting the coastal water mass and water from the west channel of the Sagavanirktok River, the Niakuk causeway would be expected to enhance the amount of marine water upwelled in the vicinity of Prudhoe Bay. The Niakuk causeway would further restrict river overflooding into Prudhoe Bay, affecting the formation of nearshore leads used by outmigrating fish in the early summer. It would also accelerate freeze-up processes within the single most important pathway used by fish migrating to and from the Sagavanirktok River overwintering sites and refuge areas.

Taken together, causeway-induced alterations in circulation patterns, water quality, and ice dynamics - occurring as they do directly within the critical nearshore estuarine zone - now make every year more similar to a naturally harsh year. The indicators show that the anadromous fish of the central Beaufort Sea are already being affected by these conditions. This means that long-term declines in their populations are likely. Should truly harsh years be in store, catastrophic impacts to these populations - and the fisheries they support - can quickly occur. Given the lack of reliable information on population sizes and the fact that monitoring programs have not been designed to measure population sizes directly, it is possible that significant declines have already begun to occur. Restoration of pre-causeway circulation patterns, particularly restoration of more continuous estuarine conditions in the nearshore zone, is necessary in order to reduce these impacts to fish habitat and water quality. In contrast, construction of additional causeways in the area would significantly increase these impacts and risks.

CONCLUSION

The nearshore estuarine conditions of the Prudhoe Bay area are critical feeding and rearing habitat for many central Beaufort Sea anadromous fish. The West Dock and Endicott causeways have significantly altered the balance of fresh and marine waters throughout this area, fundamentally altering water quality and circulation patterns along as much as 65 kilometers of coastline. The Arctic fish populations affected by these oceanographic changes are already naturally limited by their environment to the extent that they are slower growing and maturing than more southern populations. Causeway-induced habitat changes further limit the ability of these fish to obtain sufficient energy for overwintering survival, growth, and reproduction.

The causeway monitoring programs have been designed around the premise - basic to ecological study worldwide - that suitable habitat is a necessary prerequisite to healthy populations. In addition, such an approach allows mitigation decisions to be made before population-level impacts have already become irreversible, whereas simple monitoring of population sizes generally does not. As a result, post-causeway monitoring programs have not directly measured population sizes for the anadromous fish species of the Prudhoe Bay area and little or no reliable information about population sizes exists. Therefore, claims about there being a lack of evidence for population-level impacts are misleading. It is possible that significant declines are already occurring for some species, and that this is simply going unmeasured. In fact, monitoring programs have identified a variety of indicators showing that this may be the case. These indicators include: 1) basic changes in the structure of the nearshore fish community to one dominated by marine and relatively salt-tolerant species, with freshwater species having almost disappeared; 2) reduction in the strength of age-classes of Sagavanirktok River broad whitefish since 1981; 3) smaller size-at-age of large cohort of Arctic cisco in the Endicott area in 1985, together with evidence that fish may not have survived overwintering; and 4) evidence (including stomach sampling) that food organisms are not effectively unlimited.

In effect, the West Dock and Endicott causeways make each year similar to a natural winter, wherein disruption of fish habitat [illegible] the potential for survival, growth, and reproduction. The probability of population-level impacts is not presently quantifiable, but is believed to be substantial [illegible] on the variability of weather and oceanographic conditions that can be expected over the life of the causeways. Ultimately, the individual anadromous fish stocks of central Beaufort Sea populations, and the overall nearshore fish community are at risk.

Eventually, the causeways could seriously impact subsistence and commercial harvests in the Arctic. These fish are also an international resource, supporting subsistence users in both the United States and Canada, and playing an important role in the native cultures of the American Arctic. Restoration of natural nearshore circulation and water quality would be required in order to reduce the risks faced by central Beaufort Sea anadromous fish. In contrast, construction of additional causeways in the area would significantly increase the existing impacts and risks.

ANSWERS BY ROGER C. HERRERA TO QUESTIONS BY SENATOR WIRTH

1. QUESTION: Do you agree that even if we find oil in ANWR, we cannot reduce U.S. oil imports if we don't start some very serious efforts on conservation?

ANSWER: The question could be posed with equal veracity, with exactly opposite emphasis; namely, "Do you agree that even with very serious efforts on conservation we cannot reduce U.S. oil imports if we don't find significant oil in ANWR?"

To reduce U.S. oil imports by the turn of the century will require maximum oil production from the coastal plain together with a major federal program of conservation. Even with such parallel programs, we could possible achieve a maximum of three million barrels of oil per day reduction in imports. Given estimates of 20 million barrels of oil per day consumption, 6 million barrels of oil per day domestic production, the combination of ANWR oil and conservation would reduce imports to about 11 million barrels of oil per day, or 60 percent of our requirements. The principal component of the conservation effort would be increased efficiency of transportation vehicles. However, even if it was economically and practically possible to mandate a fuel efficiency of automobiles and light trucks to 50 miles per gallon by the year 2000 and also introduce 10 percent methanol into all gasoline sold, the fuel savings would represent about 2 million barrels of oil per day by the year 2000. Obviously, the introduction of more efficient vehicles would have a high upfront economic and social cost and could only be achieved gradually over a 10 year period.

These forecasts are dependent on moderate growth in America and relatively stable oil prices.

Scenarios which forecast significantly higher oil prices will result in slightly increased domestic production, marginally better conservation, a moderate reduction in imports but a highly adverse national financial impact.

It is difficult to predict a reasonable scenario which reduces future imports of oil from their present levels.

2. QUESTION: If Congress acts to open ANWR this year, when will we see oil production?

ANSWER: The experience from the development of five oil fields on the North Slope of Alaska indicates that it is difficult or impossible to reduce the time period from first discovery to first oil production to less than nine years. The time taken from the initial lease sale to

the first commercial discovery is hard to predict, but three winter seasons of exploration drilling is a reasonable guess. The language of S. 406 allows for two years from its passage to the first lease sale. These various necessary phases add up to a total of fourteen years from passage of a bill to first production with an accuracy of ± two years. Consequently, first oil to market cannot be expected prior to the year 2003.

3. QUESTION: If oil prices drop again, could that delay production from ANWR?

ANSWER: Production of oil from ANWR will only occur if a discovered oil accumulation is estimated to be commercial. The price of oil obviously affects this, but the giant oil fields which are predicted to occur beneath the coastal plain will probably be profitable under any realistic price scenario. Only production from small, marginal fields might be delayed by low oil prices.

4. QUESTION: Last year in the House, Congressman Weldon offered an amendment to make it clear that the local Native Corporation in ANWR, which can't drill now legally, would not be able to drill before the U.S. had done a first lease sale. The theory of that amendment would be that letting the Native Corporation (ASRC) go first would give them and their partners (BP America and Chevron) a tremendous information advantage before the first lease sale, and that that might reduce competition for that sale. There is no such provision in the Johnston bill. Should there be?

ANSWER: The Senate Energy Committee staff is liaising with both sides involved in this situation to arrive at a mutually acceptable solution.

5. QUESTION: Did your company bid on leases in the Chukchi Sea? Did it bid on leases from the state of Alaska for the lands offshore of ANWR?

Why did the Chukchi Sea leases draw higher prices per acre than the ones off ANWR?

ANSWER: BP Exploration bid both on the Chukchi Sea (OCS Sale 109) and State of Alaska offshore ANWR (Sale 55) lease sales. BP Exploration's average per acre bid in the offshore ANWR State acreage was $278.00 per acre, versus $44.00 per acre in the Chukchi Sea sale.

The oil industry as a whole (excluding the Shell Oil group in the Chukchi lease sale) also submitted higher bids for the State offshore ANWR acreage ($152.00 per acre) than for Chukchi Sea acreage ($85.00 per acre).

The Chukchi Sea sale results were greatly affected by the high bids of one group - Shell, et.al. - which increased the average per acre bid to $248.00. (All figures have been rounded off.)

6. **QUESTION: Does your company favor lifting the export ban now in effect on crude oil from Prudhoe?**

Do you also favor allowing export of liquified or compressed natural gas from the North Slope to the Pacific Rim?

ANSWER: Although BP America has consistently espoused free trade principles, we recognize that there are many factors to be considered in determining whether to allow the export of Alaskan crude oil. As such, BP America supported the bill reported out of the Senate Energy and Natural Resources Committee S. 2214 on March 21, 1988. Contained therein was a provision prohibiting the export of oil produced from ANWR and transported through the Trans Alaska Pipeline System.

As owner of substantial North Slope gas resources, BP America is interested in exploring the full range of options for moving the gas to market. BP America is a longtime member of the Alaskan Natural Gas Transportation System (ANGTS) Design and Engineering Cooperative Agreement aimed at moving North Slope gas by pipeline to the Lower 48 states. However, BP America believes that it is probable that a domestic market for Alaskan gas will not develop in the foreseeable future because of the vast gas volumes already available in the Lower 48 states as evidenced, for example, in the Department of Energy 1988 study "An Assessment of The Natural Gas Reserve Base of the United States." Consequently, we believe export of Alaskan gas should be an available option. On January 12, 1988, President Reagan signed a Presidential Finding approving the export of Alaskan North Slope Gas. We support that position.

Response to Questions Posed by Senator Wirth

Question 1: Do you agree that even if we find oil in ANWR, we cannot reduce U.S. oil imports if we don't start some very serious efforts on conservation?

Answer: ARCO has a long history of support for energy conservation. We believe that existing conservation programs should be retained, including C.A.F.E. standards, the 55 m.p.h. speed limit, and appliance efficiency standards. ARCO has also been an industry leader in the development of alcohol fuels. But, while conservation measures are an important part of a secure energy future, so is domestic production. Oil produced from ANWR clearly will reduce imported oil. As I pointed out in my testimony, ANWR production should be viewed as a significant buffer against imported oil supply cutoffs and price increases, not as a way to replace totally our reliance on imported oil.

Question 2: If Congress acts to open ANWR this year, when will we see oil production?

Answer: The answer depends upon a number of unpredictable events. The chief variables are: (a) the lease sale schedule, (b) when a discovery is made, (c) the time required to finish environmental reviews and obtain permits and (d) facility design and construction. Given these uncertainties weighed against our prior Arctic experience, we have estimated that it will probably be at least 10 years after a discovery before production into TAPS could occur. Note that this period could be reduced if the lease sale schedule and other environmental reviews were streamlined or compressed--up to 5 years could be saved if current leasing and environmental rules were applied to ANWR development.

Question 3: If oil prices drop again, could that delay production from ANWR?

Answer: Economic development of petroleum reservoirs depends upon both current and predicted future prices evaluated in light of the estimated cost of production, which includes such elements as the size and configuration of the reservoir, well and facility costs, and transportation costs. It is thus hard to estimate what effect a price decrease would have on development of an ANWR discovery without knowing what sort of reservoir is assumed and what the other costs would be. What we do know is that given current prices, and our best price predictions, a number of structures in ANWR appear to

be adequate in size to develop on an expedited basis if oil were discovered.

Question 4: Last year in the House, Congressman Weldon offered an amendment to make it clear that the local Native Corporation in ANWR, which can't drill now legally, would not be able to drill before the U.S. had done a first lease sale. The theory of that amendment would be that letting the Native Corporation go first would give them and their partners (BP-America and Chevron) a tremendous information advantage before the first lease sale, and that that might reduce competition for that sale. There is no such provision in the Johnston bill. Should there be?

Answer: ARCO has supported such drilling restrictions in the past. We understand that the Committee is in the process of negotiating a resolution of this issue.

Question 5: ARCO Solar is the largest solar manufacturer in the U.S. The U.S. is the leading exporter of solar cells, although other nations are rapidly increasing their share of [what] DOE describes as a fast-growing world market. Is it true that ARCO has been trying to sell ARCO Solar, and that ARCO management has discussed selling ARCO Solar to a number of entities, including Japanese companies?

Answer: ARCO is working on the sale of ARCO Solar. We have discussed the possiblity of a sale with a number of investors, the majority being U.S. based firms. ARCO hopes to sell its solar business to an entity that will continue with a high level of committment in advancing solar technology.

Question 6: Did your company bid on leases in the Chukchi Sea? Did it bid on leases from the state of Alaska for the lands offshore of ANWR? Why did the Chukchi Sea leases draw higher prices per acre than the ones off ANWR?

Answer: Yes. ARCO successfully bid on leases in both the Chukchi Sea sale and in state Sales No. 55 and No. 50, off ANWR.

The bids offered at lease sales depend on the acreage offered, the terms of the leases, the bidder's assessment of the potential or known structures, likely competition, and other factors, such as the difficulty of permitting, the cost of development and the forecasted price of oil. Bid prices, therefore, vary considerably among bidders and among tracts.

Comparing overall average per acre bid prices for the sale is not, in our view, a meaningful measure.

Question 7: Does your company favor lifting the export ban now in effect on crude oil from Prudhoe? Do you also favor allowing export of liquified or compressed natural gas from the North Slope to the Pacific Rim?

Answer: ARCO has remained neutral on proposals to lift the crude oil export ban.

We have supported exports of NGL's to the Pacific Rim due to the limited West Coast market for NGL's.

APPENDIX II

Additional Material Submitted for the Record

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MEMORANDUM

OFFICE OF
EXTERNAL AFFAIRS

March 6, 1989

FROM: Patrick H. Quinn
Director
Office of Congressional Liaison

TO: Thomas B. Williams
Professional Staff Member
Senate Environment and Natural Resources Committee

Per your request, attached is a copy of an EPA staff Draft Report on Management of Oil and Gas Wastes on Alaska's North Slope.

Sylvia K. Lowrance, Director of EPA's Office of Solid Waste, has informed me that this staff draft, which was released without Agency knowledge, is poorly written and organized. It includes a mix of fact from EPA site visits with conjecture from non-EPA sources. The report has had limited management review. That preliminary review resulted in significant concerns about the quality of the report which dictates substantial additional work before this document will be finished.

As written, although there appears to be some useful information in the report, it goes beyond what can be documented and is not an objective portrayal; nor does it in any way constitute an official Agency finding or position.

Should you have any questions regarding the attached or related matters, please let me know.

ATTACHMENT

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INTRODUCTION

Purpose and Scope

Under Section 3001 (b) (2) (A) of the 1980 Amendments to the Resource Conservation and Recovery Act (RCRA), Congress temporarily exempted several types of solid wastes from regulation as hazardous wastes, pending further study by the EPA. Among the categories of wastes exempted were "drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil or natural gas." Section 8002 (m) of the 1980 Amendments required the Agency to study these wastes and submit a report to Congress evaluating the status of their management. In December of 1987, the Agency submitted to Congress its report titled "Management of Wastes from the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy".

After the close of the public comment on the report to Congress, the Agency issued its regulatory determination in June of 1988 based on the report to Congress and subsequent public comments (53 FR 25446). The regulatory determination stated: "The Agency has completed these activities and has decided that regulation under RCRA Subtitle C is not warranted. Rather, EPA will implement a three-pronged strategy to address the diverse environmental and programmatic issues posed by these wastes by: (1) Improving Federal programs under existing authorities in Subtitle D of RCRA, the Clean Water Act, and Safe Drinking Water Act; (2) working with States to encourage changes in their regulations and enforcement to improve some programs; and (3) working with Congress to develop any additional statutory authorities that may be required."

This document represents part of the EPA's ongoing effort to characterize and analyze waste management practices and State and federal regulatory programs for wastes generated during the exploration, development and production of crude oil and natural gas.

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and to work with the States and industry to improve existing regulatory design, implementation, and enforcement. This document seeks to provide a description of current waste management practices used on the North Slope and present the major facts and issues relating to these practices. In preparing this document, EPA chose to discuss a wide variety of facilities (a total of 35 sites are described) and present any available information on these facilities. In describing a wide variety of facilities, this document attempts to identify major waste management practices, and describe how current State regulations are implemented and enforced as they apply to the current waste management practices on the North Slope.

It is EPA 's intention that this document be used by the State in its ongoing efforts to improve existing State regulatory programs by: 1) Providing the State with a description of the past performance its regulatory program as it applies to the management of wastes generated by the exploration, development and production of crude oil and natural gas; 2) Identifying existing deficiencies in current State regulations and statutory authority; and 3) Assessing the adequacy of current State enforcement resource allocation for enforcement of State regulations.

Further, it is EPA's intention that this document be used by industry to: 1) Assess the environmental impact of current waste management practices; 2) Provide a third party review of industry's environmental programs as implemented on the North Slope; and 3) Promote the use of resources to further study topics such as innovative approaches to waste management on the North Slope, waste minimization techniques, recycling opportunities, and waste treatment techniques, so as to reduce industry's reliance on disposal options for waste management.

EPA will use this document to focus the Agency's efforts in developing tailored standards for the management of wastes generated by the exploration, development, and production of crude oil and natural gas under RCRA Subtitle D. In addition, EPA will use this document to identify deficiencies in other programs within EPA as they apply to the oil and gas industry, and to identify deficiencies in other Federal programs outside of the Agency as they apply to oil and gas waste management. EPA views this document as the first in a series of similar documents that will be used to assemble and disseminate information on oil and gas waste management to States, industry, and the public sector.

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Officials with EPA's Office of Solid Waste, Special Waste Branch, first toured the North Slope oil fields in the fall of 1987. On June 14 through 17, 1988, an EPA contractor toured North Slope oil production facilities. The contractor was accompanied by Standard Alaska and ARCO personnel on June 14 and 15, and was accompanied by Alaska Department of Environmental Conservation (ADEC) officials on June 16 and 17. In August of 1988, an official with EPA's Office of Solid Waste, Special Waste Branch, toured the North Slope oil fields with both industry personnel and ADEC personnel. This document incorporates EPA's observations and information obtained over the past several years. Sites discussed in this report are indicated on maps in figures 1,2, and 3.

The site descriptions consist of observations made at the individual sites; information from interviews with oil company officials, State of Alaska Department of Environmental Conservation (ADEC) officials, Alaska Department of Fish and Game officials, and oil field and service company operators; regulatory history of the sites where applicable or where information is available; and recent regulatory developments at individual sites where applicable. Sites visited were selected by industry officials and ADEC personnel, and include drillsites, a gathering center, recycling centers, oily waste injection facilities, a drum rinsing facility, a sewage treatment facility, gravel mine sites, the ARCO Crude Oil Topping Unit, the North Slope Borough's Oxbow landfill, an abandoned oily waste pit, abandoned reserve pits, and service company sites in Deadhorse, both active and inactive. Photos were taken during the site visits and are referred to throughout the text.

Regulatory Context

The Resource Conservation and Recovery Act is the primary Federal statute governing the transportation, storage, and disposal of hazardous and solid wastes. Subtitle C of RCRA applies to hazardous waste as defined under RCRA and has stringent requirements for the transportation, storage, and disposal of hazardous wastes. EPA may grant authority for implementation and administrative responsibility for Subtitle C to a State that develops its own program to manage hazardous wastes provided the program is equivalent to and no less stringent than the Federal RCRA Subtitle C program. Alaska is not yet a RCRA delegated State; however, the State has promulgated hazardous waste

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regulations and is presently enforcing them in cooperation with EPA. If the State's hazardous waste program gains full authorization from EPA under RCRA, then enforcement of Subtitle C will fall primarily on ADEC. Subtitle D of RCRA applies to all non-hazardous solid wastes and provides broad, general guidelines for the disposal of all non-hazardous solid wastes. Under Subtitle D, the Agency is not provided with Federal enforcement authority, and State participation in Subtitle D is largely voluntary. As previously noted, EPA, in its June 1988 regulatory determination, provided for the exclusion of certain oil and gas wastes from the Subtitle C program.

According to EPA's regulatory determination on wastes generated from the exploration, development, and production of crude oil and natural gas: "Based on the language of RCRA section 3001 (b) (2) (A) of the 1980 amendments to RCRA, review of the statute, and supporting legislative history, the Agency believes that the following wastes were included in the temporary exemption set forth in the statute: Produced water; drilling fluid; drill cuttings; rigwash; drilling fluids and cuttings from offshore operations disposed of onshore; well completion, treatment, and stimulation fluids; basic sediment and water and other tank bottoms from storage facilities that hold product and exempt waste; accumulated materials such as hydrocarbons, solids, sand, and emulsion from production separators, fluid treating vessels, and production impoundments; pit sludges and contaminated bottoms from storage or disposal of exempt wastes; workover wastes; gas plant dehydration wastes, including glycol-based compounds, glycol filters, filter media, backwash, and molecular seives; gas plant sweetening wastes for sulfur removal, including amines, amine filters, amine filter media, backwash, precipitated amine sludge, iron sponge, and hydrogen sulfide scrubber liquid and sludge; cooling tower blowdown; spent filters, filter media, and backwash (assuming the filter itself is not hazardous and the residue in it is from an exempt waste stream); packing fluids; produced sand; pipe scale, hydrocarbon solids, hydrates, and other deposits removed fro ping and equipment prior to transportation; hydrocarbon-bearing soil; pigging wastes from gathering lines; wastes from subsurface gas storage and retrieval, except for the nonexempt wastes listed below [see next paragraph]; constituents removed from produced water before it is injected or otherwise disposed of; liquid hydrocarbons removed from the production stream but not from oil refining; gases from the production stream such as hydrogen sulfide and carbon dioxide, and volatilized hydrocarbons; materials ejected from a producing well during the process known as blowdown; waste crude from primary field operations and production;

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and light organics volatilized from exempt wastes in reserve pits or impoundments or production equipment."

The regulatory determination further states: "The Agency believes that the following wastes were not included in the original [RCRA Section 3001 (b) (2) (A)] exemption: unused fracturing fluids or acids; gas plant cooling tower cleaning wastes; painting wastes; oil and gas service company wastes, such as empty drums, drum rinsate, vacuum truck rinsate, sandblast media, painting wastes, spent solvents, spilled chemicals, and waste acid; vacuum truck and drum rinsate from trucks and drums transporting or containing non-exempt waste; refinery wastes; liquid and solid wastes generated by crude oil and tank bottom reclaimers; used equipment lubrication oils; waste compressor oil, filters, and blowdown; used hydraulic fluids; waste solvents; waste in transportation pipeline-related pits; caustic or acid cleaners; boiler cleaning wastes; boiler refractory bricks; boiler scrubber fluids, sludges, and ash; incinerator ash; laboratory wastes; sanitary wastes; pesticide wastes; radioactive tracer wastes; and drums, insulation, and miscellaneous solids."

Crude oil and natural gas exploration, development, and production waste management is regulated by several agencies on the North Slope. The Alaska Department of Environmental Conservation (ADEC) is the primary pollution control agency within the State. ADEC's responsibilities include issuing permits for all solid waste disposal activities; permitting wastewater discharges, and air contaminant emissions; inspecting field operations; permitting and inspecting commercial waste management facilities and surface installations at Class II injection facilities (the Alaska Oil and Gas Conservation Commission has primacy under the Federal Underground Injection Control (UIC) program for regulation of Class II injection wells as discussed below); regulating hazardous waste, and overseeing oil spill control efforts; taking enforcement actions where necessary; and working with industry to improve current waste management methods. As Alaska does not have primacy for the National Pollution Discharge Elimination System (NPDES) program, ADEC coordinates with EPA Region X, which administers the NPDES program in Alaska.

Currently, ADEC can issue Notices of Violation for oil field activities that are out of compliance with State regulations, and it can write compliance orders to specify actions that will bring the noncomplying operator into compliance. However, ADEC does not have the authority to issue fines or shut down production for noncompliance with State

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environmental regulations.[1] If ADEC believes that a particular incident of noncompliance warrants additional effort on the part of the State beyond issuing a compliance order, ADEC can request that the State Attorney General pursue the matter in court. Under this arrangement, the court can levy a fine against the noncomplying operator. To date, only once in the case of North Slope Salvage, Inc. (described in the text under the section discussing service companies) has the State Attorney General obtained a fine or penalty in court against an operator conducting business on the North Slope.

Under the Safe Drinking Water Act, the Underground Injection Control program provides for five different classes of injection wells, where the class designation is dependant upon the use of the well (this report discusses the first two classes, as Class III, IV, and V are not relevant to this report). Class I injection wells are usually designed and permitted for the disposal of RCRA hazardous waste, although a Class I well can be permitted for receiving nonhazardous industrial waste. Class II injection wells are those used by the oil and gas industry to reinject produced water for enhanced recovery and for the disposal of industrial wastes exempt from regulation under RCRA Subtitle C by RCRA section 3001 (b) (2) (A). EPA delegates authority to authorized States for administration of the Class I and Class II regulations under the UIC program. EPA has delegated the authority to administer the UIC program for Class II wells to the Alaska Oil and Gas Conservation Commission. Currently, there are no Class I wells permitted in Alaska, although a permit application is pending with EPA Region X for Class I status for the Prudhoe Bay Unit Pad 3 injection facility as discussed in detail in the text. Alaska does not currently have delegated authority from EPA to administer the UIC Class I program.

Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers is responsible for issuing permits for dredge and fill activities on wetlands defined as part of the waters of the United States. EPA has review responsibility for such permits. On the North Slope, the Army Corps of Engineers' primary responsibility is issuing permits for construction of gravel pads for industrial facilities, and construction of gravel roads, causeways, and islands. (The North Slope oil fields are located in designated wetlands). On the North Slope, all pads, roads, and facilities must have Section 404 permits. The

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[1] Many agencies that regulate the oil and gas production industry in other States have such authority.

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U.S. Fish and Wildlife Service has comment responsibility for permits issued under Section 404.

The U.S. Bureau of Land Management is responsible for all oil and gas activity on federal and Indian lands. The authority includes leasing, bonding, royalty arrangements, construction and well spacing regulations, waste handling and disposal, site reclamation, and site maintenance. Half of Alaska's 370 million acres are under federal ownership, and there are currently approximately 150 producing oil and gas wells on federal leases; however, all current activities in the North Slope oil production area occur on State lands.

The Alaska Department of Natural Resources issues surface and subsurface oil and gas leases on State land. The Department also approves plans for operation of all oil and gas facilities on State lands, and conducts field inspections of operations and abandonments.

The Alaska Department of Fish and Game has jurisdiction over the use of surface waters on the North Slope in conjunction with wildlife and aquatic habitat management; however, this jurisdiction does not include issuance and enforcement of NPDES permits (as discussed above, ADEC assists EPA Region X in issuance and enforcement of NPDES permits on the North Slope).

Liquid Waste Production and Disposal at Oil and Gas Production Facilities

In March of 1988, ADEC completed a report entitled, "A Review of Liquid Waste Production and Disposal at Oilfield Facilities on the North Slope of Alaska." The report discusses types of liquid waste generated and the various methods of disposal utilized. According to the report (ADEC 1988v): "Activities associated with petroleum exploration, and oilfield development and operation produce enormous quantities of waste. The character of these wastes, both liquid and solid, vary a great deal. Wastes are produced on and offshore and are disposed by subsurface injection and discharge to the land and waters of the state and marine waters." The report discusses the waste management practices for several high volume liquid wastes including produced water, reserve pit fluids, hydrostatic testing fluids, domestic wastewater, and excavation dewatering.

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Subsurface Injection of Wastes

As discussed in the ADEC report, subsurface disposal of waste has occurred in both shallow or nonhydrocarbon bearing geologic zones, and deep hydrocarbon bearing geologic zones. Waste injection into nonhydrocarbon bearing zones has occurred through annular disposal (disposal through the annulus or space between the casing and tubing in a well) and through dedicated waste injection wells such as those at the Prudhoe Bay Unit Pad 3 discussed in detail later in this text.

Produced water represents the largest volume of liquid waste generated on the North Slope. For example, in the month of December, 1987, more than 924 million gallons of water were produced in North Slope production operations. According to the ADEC report, produced water coming from the oil production zones on the North Slope contains approximately 20,000 mg/l total dissolved solids (TDS), approximately 20 mg/l suspended solids, and 20-250 mg/l hydrocarbons. Produced water also contains varying amounts of volatile organic compounds, such as benzene, toluene, and xylene, that are included on the list of toxic priority pollutants contained in Section 307 (a) (1) of the Clean Water Act of 1977 (EPA 1987). Currently, on the North Slope most produced water generated is reinjected in a waterflood program for enhanced recovery. At the end of 1987, there were 355 enhanced recovery wells reinjecting produced water back into the hydrocarbon bearing formations. Before the waterflood program came on line in 1981, most produced water was disposed through dedicated shallow zone injection wells such as those at Pad 3.

In addition to the injection wells located at Pad 3, shallow zone dedicated waste injection wells located at the large gathering centers or oil/water/gas separation facilities are used for disposal of mixed wastes as well as some produced water. According to the ADEC report, these wastes are similar in content to those injected at Pad 3. As mentioned earlier, some liquid waste is disposed through annular injection. As stated in the ADEC report: "Injection of liquid wastes into shallow nonhydrocarbon geologic zones through well annuli is a common practice in the North Slope oilfields. Our first year of record for this activity on the North Slope is 1983....Typical onshore disposal depth is between 2,000 and 4,000 feet. Onshore disposal depth has occurred as shallow as 1,000 feet." In 1986, a total of 116 thousand gallons of liquid waste were disposed through the annuli of 171

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wells. In 1987, 74.4 thousand gallons of waste were disposed through the annuli of 89 wells.

Surface Disposal of Wastes

Several methods of surface disposal of wastes have been used on the North Slope including discharge of reserve pit fluid to the tundra, surface oiling, disposal of reserve pit fluids to roads, discharge of hydrostatic testing fluids to the tundra, discharge of treated domestic waste water, and excavation dewatering. As discussed below, some of these practices have been discontinued, while others are currently being used for liquid waste disposal.

Discharge of Reserve Pit Fluids to the Tundra

Oil production facilities on the North Slope are centered around large, generally unlined pits constructed of gravel, referred to as "reserve pits". In the course of development of the North Slope oilfields, hundreds of reserve pits have been constructed in association with both exploratory and production oil well drilling (ADEC 1988v). The reserve pits are constructed within the unconsolidated gravel pads used to support production equipment on the Arctic tundra, and production wells are drilled around the perimeter of these reserve pits. According to the ADEC report on liquid waste generation and disposal, in the course of development and operation of production wells wastes are deposited in the reserve pits including drilling muds, cuttings, produced water, truck rinsates, crude oil, rig wastewater as well as contaminated snow and spill materials. As stated in the ADEC report (ADEC 1988v): "Fluid management problems occur because the pits collect water from natural sources primarily rainfall and snowmelt which mixes with reserve pit fluids. Problems associated with this addition of water include: 1) increased reserve pit leakage due to increased hydraulic head, 2) fluid overtopping reserve pit dikes, 3) breaching of reserve pit dikes, and 4) increased volumes of contaminated water for disposal."

According to ADEC, until the 1988 summer season discharge to the tundra under permit with ADEC was the most common method of disposal of reserve pit fluids. As the ADEC report states: "The most recent reserve pit dewatering general permit requires a notice of disposal, complete with characterization of pit fluids, and establishes effluent

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limitations, monitoring and reporting requirements. Effluent limitations include: COD of 200 mg/l; salinity of 3 ppt; settleable solids of 0.2 ml/l, oil and grease of 15 mg/l, total aromatic hydrocarbons of 10 mg/l, and pH between 6.5 and 8.5. Additional effluent limitations exist for specific elements." In 1983, ARCO, Conoco, and Standard dewatered reserve pits through discharge to the tundra; in 1984, ARCO and Standard dewatered reserve pits through discharge to the tundra; in 1985, ARCO, Exxon, and Standard dewatered reserve pits through discharge to the tundra; in 1986, ARCO, Conoco, Standard and Exxon dewatered reserve pits through discharge to the tundra; and in 1987 ARCO dewatered reserve pits through discharge to the tundra. During the 1986 season, a record volume of 64,568,520 gallons of reserve pit fluids were discharged to the tundra.

ADEC has compiled a list of approximately 25 reserve pits referred to as the "Problem Pit List" (ADEC, 1987e). ADEC has documented spillage, leaking, breaching or overtopping at these "problem pits". Currently, North Slope operators have ceased all dewatering of the reserve pits onto the tundra and efforts have begun to line leaking reserve pits, repair breached berms around reserve pits, and close out several of the "problem pits". ADEC has not issued a permit for dewatering of reserve pits through discharge to the tundra since the 1987 summer season. Although the current regulations allow such discharges, as a matter of policy ADEC does not anticipate issuing any further permits for these discharges.

Because the use of permanent reserve pits is currently an integral part of North Slope oil and gas production operations, the following discussion is included. It should be noted that while many unlined reserve pits are currently in use on the North Slope, new State regulations require that construction of new reserve pits include a full liner. In addition, the industry is experimenting with the possibility of eliminating permanent reserve pits at production facilities on the North Slope in areas that are not yet developed.

In the fall of 1988, personnel with the U.S. Fish and Wildlife Service (USFWS), and Battelle Pacific Northwest Laboratories published an article describing a study they conducted at five drill sites measuring the impact of reserve pit seepage and discharge to the surrounding tundra (Woodward, Snyder-Conn, Riley, and Garland, 1988). According to the authors: "The objectives of this study were to select five drilling sites in the Prudhoe Bay area, determine the inorganic and organic chemistry of water in the reserve pits and surrounding ponds, and correlate these findings with acute and chronic toxicity evaluations

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of water from these pits and ponds." As stated by the authors : "In 1984, ADEC permitted the discharge of reserve pit fluids into tundra wetlands from 23 pits in the Prudhoe Bay area, and in 1985 the fluids from about 40 reserve pits were discharged into the tundra in the Prudhoe Bay-Kuparik area, both from onshore and offshore sources."

The USFWS-Battelle article explains: "During exploration and production, reserve pits are used for storage of excess drilling fluids, cuttings, boiler blowdown, and rig-washing fluids. More than 600 additives are potentially available for use in drilling fluids (API 1969; Dames and Moore 1978; National Research Council 1983). Many additives are known to be toxic, such as aromatic hydrocarbons, bactericides, brines, lignosulfonates, emulsifiers, and metals (ERL 1984). Despite the complex composition of reserve pit wastes and their potential toxicity to aquatic organisms and migratory birds, discharges from the pits occur more frequently on the North Slope of Alaska than at sites in the conterminous 48 states. Permafrost and low evaporation rates inhibit natural losses of reserve pit fluids, and repetitive use of the same reserve pit for multiple wells and fresh snowmelt each year continue to add volumes to the pits."[2]

The article further explains: "In addition to oil production, the wetlands on the North Slope serve as important summer nesting and rearing grounds for numerous species of shorebirds, waterfowl, seabirds, raptors, and passerines (Norton *et al.* 1975). Some of these species have no other known breeding ground or are threatened with extinction. Wetland ponds are rich in zooplankton, important in waterfowl food chains. The spring thaw in the wetlands and the production of invertebrates is closely tied to the time of waterfowl nesting, and coincides with peak discharges of drilling fluid wastes from reserve pits. Wetland ponds are connected by networks of natural troughs that eventually reach fish producing streams. In 1983, the dewatering of reserve pits resulted in a significant impairment of water quality in ponds adjacent to reserve pits (West and Snyder-Conn 1987). When compared to ponds further from drill sites, adjacent ponds were lower in abundance and diversity of aquatic invertebrates."

According to the article: "Ions elevated in water were Ba (barium), Cl [chlorides], Cr [chromium], K [potassium], SO_4 [sulfates], and Zn [zinc]. Concentrations of Cu

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2 References in the USFWS article are included in the reference list for this document.

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[copper], Cr [chromium], Fe [iron], Pb [lead], and Si [silica] in sediments were higher in near and distant ponds than in control ponds. The predominant organics in drill site waters and sediments consisted of aromatic and paraffinic hydrocarbons characteristic of petroleum or a refined product of petroleum....Ions elevated in RP [reserve pit] water were also significantly increased in NP [near pond] and DP [distant pond] water; only those significantly increased above CP [control pond] waters are reported here. Concentrations of Cl, K, and SO_4 were significantly elevated in eight of the nine NPs or DPs sampled, and Ba and Na were significantly elevated at seven. The magnitude of increase was greatest for SO_4: in NP and DP water, it was elevated by 80- to 470-fold above the mean of the CP stations. Trace elements Cr and Zn at NP4 and 7 were increased 3- to 6-fold above background concentrations."

The reserve pit sediments sampled indicated much higher concentrations of inorganic ions than did the reserve pit water sampled. Aluminum was found in reserve pit sediments in concentrations as high as 21,000 mg/kg; barium as high as 7,380 mg/kg; chromium as high as 792 mg/kg; copper as high as 1,780 mg/kg; lead as high as 1,300 mg/kg; and zinc as high as 2,290 mg/kg.

Aromatic hydrocarbons detected in water and sediments from the reserve pits, near ponds, and distant ponds included alkylated benzene, naphthalene, fluorine and phenanthrene. Paraffinic hydrocarbons were also detected in reserve pits, near ponds and distant ponds. Mean concentrations of aromatic hydrocarbons in water samples ranged from 0.07 ug/l in a control pond to 9.6 ug/l in a distant pond; and the range for sediment samples taken was 2.5 mg/kg in a reserve pit to 133 mg/kg in a near pond to 263 mg/kg in a reserve pit. For paraffinic hydrocarbons detected in sediments the mean concentration level ranged from 7 mg/kg in a distant pond to 700 mg/kg in a near pond.

Near pond and distant pond sediments indicated higher concentrations of inorganic ions than did near pond and distant pond water sampled. According to the article: "For the seven NP and DP stations where triplicate [sediment] samples were analyzed, Cu, Cr, Fe, Pb, and Si were the most frequently elevated. Increases over background were greatest at NP6, where concentrations of Pb and Cr were increased by 22- and 14-fold respectively." For near pond sediments, barium concentrations ranged from 1,560 mg/kg to 9,593 mg/kg; chromium concentrations ranged from 107 mg/kg to 559 mg/kg; copper concentrations ranged from 24 mg/kg to 46 mg/kg; and lead concentrations ranged from 30 mg/kg to 133

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mg/kg. For distant pond sediments, barium concentrations ranged from 292 mg/kg to 17,737 mg/kg; chromium concentrations ranged from 50 mg/kg to 189 mg/kg; copper concentrations ranged from 18 mg/kg to 39 mg/kg; and lead concentrations ranged from 9.3 mg/kg to 44 mg/kg.

The USFWS-Battelle authors go on to state: "In 96-hr exposures in the field, toxicity to *Daphnia Middendorfiana* was observed in water from all reserve pits, and from two of five near ponds, but not from distant ponds. In laboratory tests with *Daphnia magna*, growth and reproduction were reduced in dilutions of 2.5% drilling fluid (2.5 drilling fluid: 97.5 dilution with water) from one reserve pit, and 25 % drilling fluid from a second. Growth and reproduction were not affected at these dilutions of fluid from the other three reserve pits."

On February 16, 1988, the Natural Resources Defense Council (NRDC) notified Standard Alaska Production Company and ARCO Alaska, Inc. of their intent to file suit for violations of the Federal Water Pollution Control Act, 33 U.S.C. §§1251-1376 (the "Clean Water Act"). According to the letters from NRDC to Standard and ARCO: "ARCO [and Standard] has disposed of material from its reserve pits in various ways. ARCO [and Standard] allows some of the reserve pit waste to leak, seep, or otherwise escape from the reserve pits. Such leaks violate the "Section 404 permits" from the Army Corps of Engineers pursuant to which ARCO was allowed to construct the reserve pits. Such leaks also violate the Clean Water Act because they are discharges of pollutants for which ARCO lacks a required National Pollutant Discharge Elimination System (NPDES) permit.

"ARCO [and Standard] also "dewaters" the reserve pits by discharging liquid from the pits directly onto the tundra wetlands. Such discharges violate the Clean Water Act because they are discharges of pollutants for which ARCO [and Standard] lacks a required NPDES permit. In addition, ARCO [and Standard] applies some of the liquid from the reserve pits from mobile trucks onto roads in tundra wetlands and thereby into such wetlands. Such discharges violate the Clean Water Act because they are discharges of pollutants for which ARCO [and Standard] lacks a required NPDES permit."

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To date, NRDC has proceeded to file suit against ARCO, Alaska; NRDC has not filed suit against Standard Alaska Production Company.[3]

Disposal of Reserve Pit Fluids to Roads

As stated by the ADEC report on liquid waste generation and disposal on the North Slope (ADEC 1988v): "Road watering, a method of dust suppression, is a widespread practice at North Slope oil production facilities. Water from local rivers, lakes or flooded mine sites is used for road watering. Reserve pit fluids are also disposed onto roads in the same manner. Reserve pit fluids may contain hydrocarbons, metals, and other toxic substances. The fate of water borne pollutants in the roadbed is not known at this time. Some possible fates of pollutants include attenuation or chemical attenuation in the roadbed, washing or leaching from the roadbed to the surrounding environment, or escape in road dust to the environment. A permit allowing on-road disposal of reserve pit fluids was developed and first issued in 1985. The two permits issued in 1985 were issued late in the road watering season and only 1,135,890 gallons of pit fluids were discharged. Two similar permits were issued in 1986 and 1987 which allowed 36,924,594 and 26,540,346 gallons, respectively, of reserve pit fluids to be disposed to roads. An additional permit was issued in 1986 allowing on-road disposal of secondary treated domestic wastewater and under this permit, 638,400 gallons of water from one sewage lagoon were disposed to the roads." During the 1988 summer season, North Slope operators did not dispose of reserve pit fluids through road watering.

On October 4, 1988, ARCO applied to EPA Region X for a fieldwide NPDES permit for the Kuparuk field. In addition to other discharges, the application requests that ARCO be allowed to resume disposal of reserve pit fluids through roadwatering. As stated in the cover letter (ARCO 1988i): "Of these sources, most are currently permitted by the State of Alaska Department of Environmental Conservation. Please note that, with respect to the last potential source in the application (Source 005, discharge of reserve pit waters to roads), we are asking for an EPA determination of whether or not such activity is subject to NPDES permitting authority. We have enclosed a study with the application which we

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3 NRDC proceeded with its suit against ARCO because during the 1987 summer season the company continued to use discharge to the tundra as a means of dewatering reserve pits. Standard did not discharge reserve pit water to the tundra in 1987.

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believe demonstrates that NPDES authority does not extend to such activity. As you know, ARCO has halted use of reserve pit fluids for road watering and will not resume such activity until all state and federal permitting issues are resolved."

Disposal of Hydrostatic Testing Fluids

According to the ADEC report on liquid waste generation and disposal: "Hydrostatic testing of pipelines and vessels is a common practice during oilfield development. Several types of fluids are used including freshwater, saltwater, methanol, glycols, and diesel. If water is the test fluid, discharge to the tundra is allowed, via an ADEC general permit. The permit may be used for discharges of less than 1,500,000 gallons of water. Written notification to the department prior to discharge is required for discharges of greater than 50,000 gallons; however, the permit effluent limitations apply to all discharges of hydrostatic test fluids. Post-discharge reporting is required only for notification of permit non-compliance. Test vessel failure and discharge of test fluids are potential sources of pollutants. The greatest amount of hydrostatic test fluid discharged during our years of record occurred during 1985 [13,941,560 gallons were discharged by ARCO and Conoco]. No discharge of this kind occurred in 1987." North Slope operators did not dispose of hydrostatic test fluid through road spreading in 1988 as well; however, in the previously mentioned NPDES permit application submitted by ARCO, the company is requesting that discharges of hydrostatic test fluids be included in permitted discharges in the Kuparuk field (ARCO 1988i).

Surface Oiling

As discussed in the ADEC report (ADEC 1988v): "Oiling roads for dust suppression and road surface maintenance has been done in many parts of the nation for many years. This activity has occurred in Alaska via the surface oiling permit issued by ADEC. Projected application volumes of oil is required in permit applications but reporting of actual volumes of oil used was not required until 1984. Through 1984 a great disparity existed between the amounts of oil permitted for discharge and actual volumes of fluids applied to roads under this permit [see table below]. This occurred because reserve pit fluids containing a small percentage of oil were applied to roads under this permit. The surface oiling permit was not intended to permit the disposal of wastewater and this activity was reduced in 1985 and ceased in 1986....No road oiling occurred in 1987."

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	1983	1984
ARCO		
Permitted Oil Volumes	200,000	350,000
Estimated Oil Applied	23,468	22,953
Pit Fluids Applied	25,881,744	26,922,800
Alyeska		
Permitted Oil Volumes	5,000	5,500
Estimated Oil Applied		1,500
Conoco		
Permitted Oil Volumes		100
Pit Fluids Applied		3,683,400
Crowley		
Permitted Oil Volumes	25,000	25,000
Estimated Oil Applied		20,530
SAPC		
Permitted Oil Volumes	430,000	360,000
Estimated Oil Applied		21,840
Total Permitted Volumes of Oil	660,000	740,000

Operators

Standard and ARCO, the two major operators on the North Slope, conduct most oil and gas production, drilling, and exploration operations on the North Slope; however, Conoco operates the Milne Point field, and Exxon and Chevron have drilled exploratory wells in the Prudhoe Bay production area. In addition to the onshore production on the North Slope, several large operators including Texaco and Amoco have production facilities located immediately offshore from the Prudhoe Bay area.[4] Waste management practices observed during the site visits included: injecting oily wastes and drilling fluids into centralized Class II injection wells (injection wells used by the oil and gas industry for

[4] These offshore facilities were not visited and are not specifically discussed in this report; however the service companies located on the North Slope provide materials and services to both onshore and offshore facilities, and onshore disposal facilities such as the Oxbow landfill are used by onshore and offshore production facilities for waste disposal.

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enhanced recovery and disposal are classified by EPA's Underground Injection Control program as Class II); storing damaged 55-gallon drums in overpack containers; rinsing and removing sludges from used drums and injecting the wastes in Class II disposal wells; characterizing and storing hazardous wastes in areas provided with secondary containment; disposing of oily wastes in unlined flare pits, lined and unlined pigging pits, and partially lined and unlined reserve pits; and disposal of snow removal materials (snow and gravel) in former gravel mine sites.

As oil is depleted from the North Slope fields, increasing amounts of water, natural gas and sand are produced. This phenomenon will require that the bottoms of production vessels be cleaned more frequently to remove the increased accumulation of sand and other residue. In addition to the increased production of sand and water, parts of the North Slope fields are becoming "sour" where hydrogen sulfide gas or H_2S, a very toxic gas, is formed as a result of waterflooding or enhanced recovery operations in the field. The hydrogen sulfide is produced with the oil and gas and eventually can become concentrated in the various production vessels used. Currently, North Slope operators mark areas where H_2S is present with orange windsocks to indicate wind direction in the case of an accidental release of the gas. A flow chart depicting management and disposal of all major waste streams generated by North Slope production operators is presented in figure 4.

As mentioned, dozens of independent service companies provide the entire production industry, both onshore and offshore, with a variety of oil field services. The service companies at Deadhorse build their own facilities on land leased from the State. The services provided include supplying oilfield operators with a number of oil field chemicals. These chemicals include cleaning solvents, corrosion inhibitors, antifreeze, emulsion breakers, surfactants, acids, bases, biocides, and prescription formulations as well as lubricants, drilling fluids, drilling muds, and completion and workover fluids. Many of the service companies generate unused, discarded product and spent chemicals, some of which may exhibit RCRA hazardous characteristics.

The waste management and storage practices of service companies vary significantly; however, many of those observed showed evidence of releases of contaminants to the tundra. The gravel pads of many service companies showed evidence of frequent chemical spillage which reached the surrounding tundra. Numerous incidents

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of spillage resulting in an estimated 60 acres of dead tundra are documented by ADEC.[5] The chemicals are usually stored in 55-gallon drums or in bulk tanks in areas that are not provided with secondary containment.

In mid-1985, interim status under RCRA Subtitle C expired for the Prudhoe Bay Unit Pad 3 injection facility (discussed in detail in this text), and Pad 3 stopped accepting RCRA hazardous wastes. In 1987, the operators of Pad 3 stopped accepting all third party waste for disposal, which included all service company wastes. At this time the Deadhorse service companies had to find alternate ways to handle and dispose of their wastes. As an alternative to disposal of oily wastes at Pad 3, some service companies have acquired waste oil burners or incinerators for use as space heaters, and oil/water separators for segregating oil from rinsing operations.

Incinerators or waste oil burners are not required to be permitted under State or federal air quality regulations until they reach a 1 million BTU/hour rating. According to ADEC, there are no State or federal regulations specific to waste oil burners operating below the 1 million BTU/hour rating. The service company incinerators and waste oil burners on the North Slope are rated below this level. Generally, none of the wastes generated by service companies are characterized for hazardous constituents prior to disposal or incineration. Under federal regulation, waste oil to be used in approved equipment must meet used oil fuel specifications. (However, if a company burns waste oil that it generated itself, the fuel can be off-specification.) Oil fuel specifications require that the oil contain no more than 1000 ppm halogens.

While some service company operators may use oil burners to dispose of oily, liquid waste, not all service companies have such equipment. Based on available information, it is not possible to determine how service companies not in possession of oil burners manage liquid oily waste. Nor is it possible to determine how service companies using oil/water separators dispose of the water phase of the waste which may contain toxic elements. No Class II injection well on the North Slope is currently available to service companies for disposal of liquid waste. According to ADEC, most solid wastes generated by the service companies are sent to the Oxbow landfill (described in detail later in the text).

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5 Extent of dead tundra in Deadhorse is estimated by ADEC using calibrated photographs.

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which provides the only legal means available to service companies for disposal of solid waste.

According to the July 6, 1988, Regulatory Determination, (53 FR 25446) which clarifies the types of oil field wastes subject to RCRA, solid wastes generated from an oil field support services site are not exempt under RCRA Section 3001 (b) (2) (A), and are subject to regulation under RCRA Subtitle C, although Alaska is not yet a RCRA delegated State. The State of Alaska has promulgated hazardous waste regulations and is presently enforcing them in cooperation with EPA. If the State's hazardous waste program gains full authorization from EPA under RCRA, then enforcement of Subtitle C at these service company sites will fall primarily on ADEC. A flow chart depicting management and disposal of all major waste streams generated by North Slope service company operators is presented in figure 5.

The North Slope Borough operates two major disposal facilities on the North Slope, the Oxbow landfill and the North Slope Borough incinerator, both of which are permitted by ADEC. The North Slope Borough incinerator accepts industrial and domestic waste, and ash from the incinerator is disposed at the Oxbow landfill. The Oxbow is an unlined landfill located in a portion of an abandoned gravel mine site, and is described in detail later in this text.

Alaska has no commercial RCRA-permitted Treatment, Storage and Disposal (TSD) facilities for the treatment and disposal of RCRA hazardous waste. All generators of RCRA hazardous waste in Alaska must ship the waste to TSD facilities in the Lower 48 States for disposal, or store wastes onsite under interim status.

Major Findings

Following are the major findings based on facts presented in the body of this report:

- ADEC inspectors lack the authority to issue fines or shut in production for violations of State regulations or lack of response to Notices of Violation. This lack of

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authority reduces the effectiveness of ADEC's enforcement of State and Federal regulations, especially where service company activities are involved. Furthermore, although ADEC can forward cases to the State's Attorney General for resolution in court, the State Attorney General has persued only one instance of noncompliance through the courts in a case involving North Slope Salvage, Inc.

- There are cases of documented non-compliance with existing State regulations by both the large production companies and the smaller service companies. However, noncompliance on the part of service companies is more frequent, involves more serious violations of State regulations, and service companies are less cooperative when responding to Notices of Violation.

- Operators have been claiming (and continue to claim) the RCRA exemption for wastes that clearly are not covered by the exemption. For example, ARCO operates a small "topping unit" or miniature refinery on the North Slope that produces diesel fuel. Based on available data, it appears that ARCO has never treated as hazardous any of the wastes generated from this operation. This facility may generate wastes that are listed as hazardous when generated by petroleum refineries including: K048, dissolved air flotation "float"; K049, slop oil emulsion and solids; K050, heat exchanger bundle sludges and cleaning wastes; and K051, API separator sludge. In addition, service companies may generate wastes that test RCRA hazardous such as painting wastes, solvents, and off-specification acids and chemical blends.

- There are no specific State solid or hazardous waste regulations for design, operation, and maintenance or performance of centralized or commercial waste treatment and disposal facilities. For example, permafrost is relied upon for waste containment in the design and operation of many waste disposal facilities; however there are no State requirements for determining the presence or absence of permafrost under and around waste management facilites. There are no State requirements currently in place for the management of large volumes of storm water that accumulate in facilities such as the Oxbow landfill, which is the only landfill on the North Slope that is used for disposal of industrial solid and oily wastes generated by North Slope exploration, development, and production facilities.

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- While there are no regulations specific to commercial or centralized waste disposal facilities, ADEC does have the authority to issue general permits for activities such as discharge of stormwater from a landfill; however, there are no formal criteria for such general permits, and permits are issued on a case-by-case basis. The Army Corps of Engineers have authority under Section 404 of the Clean Water Act to require specific provisions when issuing a permit for construction activities on the North Slope, including those activities involving siting and construction of commercial or centralized waste management facilities.

- Currently, North Slope operators have ceased roadspreading and discharging reserve pit fluids to the tundra; however, current State regulations do not prohibit roadspreading and discharges to the tundra. As a matter of policy ADEC has taken the position that no more general permits will be issued for the discharge of reserve pit fluids to the tundra. In October of 1988 ARCO submitted an NPDES permit application to EPA Region X requesting, among other things, that a general permit be issued for roadspreading of reserve pit fluids in the Kuparuk field.

- Based on current generation rates, there is not adequate future waste treatment and disposal capacity on the North Slope for solid industrial wastes such as oily sludges generated by various operations. For example, the oily waste pit at the Oxbow landfill is nearing capacity, and because of inadequacies in the permit application recently submitted by the North Slope Borough, ADEC and the Army Corps of Engineers have not issued a new permit that would have allowed for expansion of the oily waste disposal capacity at the Oxbow.

- None of the service companies on the North Slope has access to a disposal facility on the North Slope for liquid wastes. Many of these service companies generate a wide variety of liquid wastes, such as shop wastes, off-specification acids and chemicals, oily vacuum truck rinsate, paint thinners and solvents. While some of the larger service companies have installed oil/water separators and oil burners for management of liquid wastes, many of the smaller service companies do not have such facilities. Based on currently available information, neither the State nor EPA can determine how much of this liquid waste is managed.

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SITE DESCRIPTIONS - ARCO ALASKA

The remainder of this report is organized into four separate sections: the first section describes the ARCO Alaska sites visited, the second section describes the Standard Alaska Production Company sites visited, the third section describes the waste management facilities operated by the North Slope Borough, and the fourth section describes the service company sites visited.

Site # 1 New ARCO Drill Site at Pad 3-0 - Kuparuk Field

The new ARCO drill site is composed of a gravel pad with below-grade reserve pits. Wells drilled on this drill site are for development of the existing field. This site represents ARCO's first use of below-grade (instead of above-grade) reserve pits at a production drill site on the North Slope. Below-grade reserve pits are excavated below the ground surface. It is believed that use of below-grade versus above-grade reserve pits will minimize seeping of reserve pit waste onto the tundra and will minimize pit berm breaching during breakup. ARCO will be using below-grade reserve pits on several new drillsites in Kuparuk over the next several drilling seasons.

During drilling of production wells at the drill site, drilling mud and cuttings are discharged into this unlined, below-grade reserve pit. Upon completion of drilling at this drill site, the liquids in the reserve pit will be injected down the annulus of the well, and the solids will be covered with overburden and frozen into place inside the pit using a method referred to as "freezeback."[6] Additional production wells on this pad will be drilled around the reserve pit, and production piping will be placed around its perimeter. This new

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6 Freezeback is the term used to describe the waste disposal method where wastes are placed in a below-grade impoundment and covered with gravel or overburden. The influence of the permafrost surrounding the impoundment and the long months of freezing temperatures in the Arctic cause the wastes in the impoundment to freeze in place.

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type of reserve pit configuration will allow for easier solids removal, should the need arise prior to closure of the reserve pit. Frequently with older reserve pits, production piping was constructed over the pit from one side to the other, thus making it difficult to remove the remaining solids. Wells in this field are typically drilled to a depth of approximately 6,500 feet.

In addition to the drilling rig, a workover rig was in operation at the time of the site visit. This workover rig is used to complete the well and bring it into production once it has been drilled to the desired depth. Workover rigs are also used to "workover" a well later in the production phase. Steel tanks containing the cement and brine solution used in well completion were located adjacent to the workover rig. Additional steel tanks are used to store displaced fluids generated from the borehole and waste fluids generated from completion and workover operations. Wastes generated during completion and workover operations are disposed of in the Kuparuk oily waste injection facility, the Kuparuk recycling center, the Prudhoe Bay Unit Pad 3 oily waste disposal well and pit, or the Oxbow landfill. (These facilities are discussed in detail later in this text.)

According to ARCO personnel, the Kuparuk field contains approximately 600 wells, and workovers of these wells are performed periodically. Approximately 500 barrels of workover wastes are generated per workover per well, and some of this waste was reported by ARCO to be recyclable. According to ADEC, it has little information on file on volume and characterization of workover waste generated in the North Slope oil fields, and it is not known if ARCO or the other operators have developed this type of information on workover waste. During the 1988 summer season, 33 workovers were performed in the Kuparuk field, representing approximately 16,500 barrels of workover wastes. These wastes are disposed of at the Pad 3 oily waste disposal facility or at the Oxbow landfill.

According to ARCO personnel interviewed during the site visit, pipelines in the Kuparuk field are routinely pigged.[7] At the time of the site visit, ARCO personnel did not specify what type of pipeline is routinely pigged; however, in information submitted by

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[7] Pigging is a pipeline cleaning process in which a metal or coated plastic cylinder is pushed through production piping to remove any paraffin, solids, or scale that have collected in the piping. At the location in the pipeline where the pig is removed a pit is usually constructed to receive the pigging wastes.

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ARCO following the EPA contractor visit, ARCO states (ARCO 1988): "The only pipelines in Kuparuk which are routinely pigged are the water injection lines. Oil production lines are not pigged."

According to ARCO personnel interviewed during the EPA contractor site visit, many of ARCO's drill sites in Kuparuk have at least one pigging pit, and some are lined while others are not. Upon completion of a pigging operation, the pigging sludges are collected by vacuum truck and are injected at the ARCO oily waste injection facility. At the present, most of the pigging pits in the Kuparuk field are unlined. According to ARCO personnel, ARCO intends to begin lining these pigging pits, although no formal schedule has been proposed. According to ADEC, it has no information on file concerning characterization of pigging wastes and volumes generated.

In a letter sent to ADEC and the Army Corps of Engineers dated September 12, 1988, ARCO requested permission to construct a small pit within the reserve pit at Drill Site 1E. According to the letter, the small pit is required for pigging operations, and the pigging wastes are expected to contain trace amounts of "oil scale and iron sulfides" (ARCO 1988a). Attached to the letter is a diagram depicting the pit to be constructed. The diagram of the pigging pit is clearly labeled "liner not to be installed." According to ADEC, ARCO claims that the liner is not necessary because a curtain liner will be installed in the reserve pit in a few months. ADEC states that it has never approved the disposal of pigging wastes into reserve pits or into the pads upon which the reserve pits are constructed.

In information submitted to EPA following the EPA contractor visit, ARCO states (ARCO 1988): "The new drillsites, at which water injection is beginning, have no need for pigging operations. Accordingly, these sites do not have lined pigging pits. These new drillsites with waterflood operations are pigged to the reserve pits from which the water is immediately removed." As noted above, ADEC has never approved the disposal of pigging wastes into reserve pits, although ARCO apparently uses the reserve pits for temporary storage of pigging wastes.

At the ARCO drill site, new reserve pits were being prepared for future use. These new reserve pits were partially lined with a styrofoam material that is used to insulate the exposed permafrost. (Thawed permafrost causes subsidence of the surface, and exposed

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permafrost will melt during the summer season.) Disposal of this insulation material in the Oxbow landfill is planned following the summer drilling season. Overburden from excavation of all pits on site was stacked on one edge of the drill site. This overburden will eventually be used to close the reserve pits. (Refer to photos 1-7.)

Site # 2 ARCO Materials Storage and Drum Disposal Area - Kuparuk Field

ARCO utilizes a central area or pad for materials storage including drilling and completion materials, tubulars (piping), and spare parts. This site also has an area for storage of empty drums. The pad contains a warehouse for storage of some materials, while others are stored outside. This past spring, a spill occurred at the warehouse when drums of methylene chloride arrived in damaged condition. As a result, eight 55-gallon drums of methylene chloride-contaminated materials were shipped to a RCRA Subtitle C treatment, storage, and disposal (TSD) facility in the Lower 48 States. (Alaska has no RCRA permitted commercial TSD facilities.) According to ARCO personnel interviewed during the site visit, this was ARCO's first shipment of hazardous waste from their Arctic operations. Currently, ADEC and EPA have no information concerning the annual usage of methylene chloride and other chemicals used in the North Slope oil fields.

Empty drums are stored at the central storage site prior to crushing and disposal. The empty drums previously contained a variety of oil field chemicals including solvents, acids, biocides, corrosion inhibitors, corrosives, caustics, water treatment chemicals, and a number of hydrocarbon-based chemicals. Empty drums are stacked on wooden crates four drums high. At the time of the site visit, some drums exhibited visible signs of physical damage, rust, and corrosion, allowing for residual contents to leak out. The empty drum storage area is surrounded by a lined berm constructed of gravel. On the day of the site visit several inches of water had collected in pools inside the bermed area. The water was highly discolored by the presence of a blackish substance, and foaming action at the surface of the water was evident, apparently resulting from residues leaking from the empty drums.

At the ARCO materials storage area, drums are double drained and crushed. The oil-miscible drum residue recovered during draining is commingled with other oil-miscible wastes and recycled in ARCO's oily waste recycling center, while other liquid waste from drum cleaning operations is hauled by vacuum truck, and according to ARCO is "disposed

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at a State approved facility" (ARCO 1988). ARCO uses a private contractor to dispose of empty drums.

(Refer to photos 8-12.)

Site # 3 ARCO Abandoned Mine Site - Kuparuk field

In developing the Arctic North Slope oil fields, hundreds of millions of cubic yards of gravel have been mined from various mine sites in the area to construct gravel pads for drill sites, production equipment, pipelines, support services, and an extensive road network. All pads and roads are elevated 5 feet above the tundra with gravel. The mine sites cover areas on the order of millions of square yards and are up to 40 yards deep. Usually, between 10 and 20 yards of overburden must be removed and stacked adjacent to the mine site before suitable gravel is reached.

As documented by photographs, industry sometimes uses these abandoned mine sites for disposal of gravel and snow collected from pads during snow removal. Gravel collected during snow removal from pads may contain minor amounts of contaminants from crude oil and chemical spillage. These spills are common (hundreds of spills are reported each year), especially during the winter months. The disposal of material collected during snow removal is not regulated by the State; however, according to ADEC, the Department does prefer that snow removal material be placed in a confined area before melting so as to minimize potential migration of any contaminants removed with the snow and gravel during snow removal.

The permits or leases under which gravel mine sites are operated are issued by the Alaska Department of Natural Resources (DNR). To date, reclamation and rehabilitation requirements stated in existing leases or permits are nonspecific. A typical lease will have a reclamation provision stating that a rehabilitation plan will be developed that satisfies the Department of Natural Resources. However, this process may be changing.

In 1986, ARCO violated the DNR permit governing activities at the Sag River Mine Site C by diverting the Sag River into the mine site without the approval of Alaska Department of Fish and Game. (Alaska Department of Fish and Game has oversight authority over aquatic habitat in and around mine sites including running rivers.)

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According to the letter accompanying the Notice of Violation, dated June 16, 1986, (ADFG 1986): "Based on information obtained from ARCO and from other individuals in the Prudhoe Bay Area a channel was cut in a dike located on the west side of the mine site with a dozer [bulldozer] sometime on the 8th of June. By the evening of the 10th of June Sag Mine Site C was completely inundated with water." The letter goes on to request that a comprehensive plan for rehabilitation of the site be developed by ARCO that would: incorporate the possibility of converting Sag Mine Site C into a water reservoir; provide for fish passage into and out of the flooded site; provide for enhancement of fish and wildlife habitat at the site; and present a plan for field monitoring of fish present in the pit and evaluate the productivity of the pit as a fish habitat.

In a letter from ADFG to ARCO dated January 27, 1987, ADFG is encouraging ARCO to proceed with recommendations made by ADFG concerning the rehabilitation of Sag Mine Site C. ARCO's proposed rehabilitation plan for Sag Mine Site C stated that a choice must be made between creating fish and wildlife habitat and establishing Sag Site C as a water reservoir. ADFG disagreed, and stated: "In summary, we request that ARCO reconsider its preferred option and instead select and propose a revision of its proposed plan which takes into consideration the comments made by ADFG in the June 16, 1986 Notice of Violation. A preferred option should reflect the fact that water use and fish and wildlife are compatible and that problems such as summer drawdown can be addressed by seasonal constraints on water usage."

The ADFG letter dated January 27, 1987 goes on to state: "The Sag Site C situation underscores the need for material site rehabilitation plans in the Prudhoe Bay/ Kuparuk Development area. To our knowledge, there has not been a material site in the entire Prudhoe Bay/Kuparuk Development area where a rehabilitation plan has been completed, approved by the agencies, and implemented. A side benefit of a properly conceived and implemented rehabilitation plan, albeit after the fact, for this site should increase our field experience and on-site knowledge of what constitutes effective restoration and associated economic efficiency."

After extensive review and negotiations with ADFG, the rehabilitation of Sag River Mine Site C was completed in the fall of 1987. The rehabilitation plan involved the expansion of the pit and the creation of a shallow water zone covering about five acres. The Alaska Department of Fish and Game believed that the creation of the shallow water

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zone would enhance habitat and increase productivity of the native fish species found in the pit. According to officials with the Alaska Department of Fish and Game, the resulting 40 acre lake is now providing productive habitat for native fish.

Currently, similar rehabilitation plans are being negotiated with ARCO, Standard, and Conoco, including rehabilitation plans for the Kuparuk Deadarm area, Kuparuk Mine Site B, Kuparuk Mine Site D, Conoco Milne Point Mine Site and Put 23 and 27 (ADFG 1988a). According to ADFG officials, as leases for mine sites expire (leases are for five years) the Department hopes to make recommendations for adding rehabilitation plans to renewed leases. Ultimately, the Department hopes to negotiate for rehabilitation plans to be included in all new lease agreements. According to Department officials, the ADFG is hopeful that the successful effort at Sag River mine site C will encourage the operators to voluntarily agree to such rehabilitation in the future. (Refer to photos 13 and 14.)

Site # 4 ARCO's Kuparuk Oily Waste Injection Facility

ARCO disposes of nonrecyclable oily wastes in its Kuparuk oily waste injection facility. Wastes are received at the facility by tank truck. The driver of the tank truck usually makes the necessary hose connections to discharge the contents of the truck. The wastes are processed through a shale-shaker, which separates the liquids from the sludges and solids. The liquids, solids and sludges are stored in holding tanks prior to injection or disposal. The oily liquids are injected via a Class II injection well. The oily solids and sludges generated by this process are removed by a private contractor and disposed of at the Oxbow landfill via dump trucks.

According to the ADEC permit for this facility, wastes are to be injected at a depth of 3,000 to 3,500 feet. Based on a 30-day average, the quantity of liquid industrial waste disposed is not to exceed 210,000 gallons per day. The permit provides that wastes acceptable for disposal at this facility include produced water, waste oils, reserve pit fluids, waste brine, crude and diesel fuel samples, glycol and domestic wastewater (ADEC 1984).

A chemical analysis is not performed on the wastes accepted by this injection facility. However, the ADEC permit for the facility states that the permittee shall test all materials that are suspected of being hazardous and exclude them from injection.

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According to ARCO personnel interviewed during the site visit, most accepted wastes would fail the RCRA ignitability characteristic because of their high petroleum content.

According to the ADEC permit for this facility, the permittee is required to maintain a log on site that will contain the date of receipt and source of material received, volume from each source, what type of monitoring has been performed on each load and the results, and any information on extraordinary occurrences. According to information submitted to EPA by ARCO following the EPA contractor site visit, all oily waste loads are manifested under the Kuparuk Oily Waste Manifest system in compliance with permit requirements.

During the site visit, oily stains were noted on the ground around the unloading area, and there is no containment for the unloading area. (Refer to photos 15 and 16.)

Site # 5 ARCO's Oily Waste Recycling Center - Kuparuk Field

ARCO maintains an oily waste recycling center in the Kuparuk field for wastes containing recoverable hydrocarbons. This facility is similar to a crude oil reclaimer in the Lower 48 States. Hydrocarbons are removed from the incoming oily wastes by a heat treatment process and sent to the crude oil stream. The nonrecoverable liquids are commingled with water destined for ARCO's waterflood operations. The solids and sludges are disposed of at the Oxbow landfill. This facility receives oily wastes from well flowback, diesel from hydrostatic testing, and pigging wastes, lube oils, workover wastes, and other wastes. The oily wastes, received by the facility via vacuum tank trucks, are pumped into a series of four above ground tanks that separate the oil, the water, and the solids.

As documented by photographs, oily stains from drips and spills were evident on the gravel around the facility. Similar spills were evident from tanks that had overflowed, and none of the tanks were equipped with high-level alarms to alert the operator of the possibility of overflow. The unloading area, which had visual evidence of chronic spills, is not provided with secondary containment. Consequently, spillage from hose breakdowns or uncoupling is allowed to drain into the nearby gravel, thus allowing the potential for off site migration of contaminants. Oily sheens were visible on the water surface around the unloading area during the site visit.

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Three other facility storage tanks are contained within a gravel berm, which is lined. An empty, partially lined pit was located immediately adjacent to the recycling facility. ARCO employees in attendance during the EPA contractor visit were unsure of the purpose of this pit.

No chemical analysis is performed to characterize the wastes accepted by this facility; however, ARCO does use an internal manifest system to track wastes being disposed here.

(Refer to photos 17-22.)

Site # 6 Prudhoe Bay Unit Pad 3 Oily Waste Disposal Facility

Standard and ARCO jointly operate the Pad 3 oily waste disposal facility in the Eastern Operating Area of the Prudhoe Bay field. Structures at this facility include three injection wells, which were originally drilled for the purpose of testing the permafrost under different drilling conditions; a large lined oily waste pit; and a process building. The three wells were drilled in 1978, and the pit was constructed in 1987. Liquids from the oily waste pit are pumped down the injection wells. Pad 3 is located in a heavily industrialized area of the North Slope oil field, bounded on all four sides by oil production facilities, roads, pipelines, and reserve pits. ARCO's Drillsite 6 Pad is approximately 50 yards north of Pad 3. For regulatory purposes, ADEC views the Pad 3 facility as two separate entities; the surface facilities for the Class II injection wells are permitted by ADEC under a wastewater permit, and the oily waste pit is permitted by ADEC under a solid waste permit.

The operators of this facility have applied to EPA, Region X for a permit classifying all three of the injection wells as Class I Nonhazardous disposal wells. The wells are currently classified as Class II disposal wells under the Underground Injection Control program, and are regulated by the Alaska Oil and Gas Conservation Commission. Public comment received by EPA Region X on the operator's application for permitting these Class II wells as Class I, provided information that raises some questions about the performance and integrity of the Pad 3 injection wells. These comments are discussed later in this section.

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This facility accepts a variety of liquid oily waste in addition to semi-solid sludges and oily, contaminated solids. The injection well is permitted to inject liquids containing up to 15 percent solids. According to a letter from ARCO to ADEC dated February 29, 1988, incoming wastes include water-based and oil-based drilling muds, crude, diesel and diesel gel, water gel, produced water, brine, gel breaker, workover fluids, lube oil, arctic pack (diesel fuel), hydraulic fluid, spent acid, caustic, sea water, fresh water, methanol, contaminated cement, sand, gravel, snow, and other wastes (ARCO 1988b). The facility also accepts drum cleaning wastes and ARCO's and Standard's tank cleaning wastes, which typically include tank bottoms, separation vessel cleanings, and heat exchanger bundle sludges from ARCO's diesel fuel-producing topping unit.[8] Currently, the permits for this facility do not allow for disposal of RCRA hazardous wastes.

Typically, wastes are transported to the facility by vacuum truck or dump truck. As documented by photos, there is no containment area around the liquid waste unloading pad, so any spillage from hose breakdowns drains into the nearby gravel. The incoming liquid wastes pass through a series of solids removal processes. The separated liquids are injected, while the separated sludges are disposed of in the pit. Incoming sludges or solids, which are not appropriate for injection, are disposed of in the pit upon arrival. These sludges and solids, which do not enter the separation processes, include sludges from vessel clean-outs and oil-contaminated gravels and snow removed from drill sites and from spills of any contaminants that may occur.

According to ARCO personnel interviewed during the site visit, the fluids destined to be injected are tested for pH, specific gravity, and flash point. Testing is performed at the Pad 3 facility. Chemical analysis is not performed on the incoming sludges. According to facility personnel, the sludge samples are not tested for flash point because they are assumed to have a low hydrocarbon content. The operators of this facility implement an internal manifest system that requires a manifest to accompany each shipment of incoming waste. This is not required under the permit issued by ADEC. As stated in the ADEC permit for this facility, the permittee must "Record all loads by date received, waste type, and volume such that the waste type category selected portrays the nature of the oily waste

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[8] ARCO's topping unit is a small refinery that produces fuel for the many vehicles operated on the North Slope, and is discussed in detail later in this text.

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stream." At the time of the EPA contractor site visit, information was properly recorded as required by the operating permit for this facility.

The oily waste pit is lined with a synthetic liner, and thermistors have been placed in the bottom of the pit to monitor temperature. At the time of the site visit, the liner had a number of visible cracks around the edges. It is not known whether the liner in the bottom of the pit has similar cracks. There are no monitoring wells or leak detection devices present at the oily waste pit. According to Standard personnel interviewed during the site visit, the pit may be tested for leaks during the summer of 1988, although the method to be used is undetermined.

As documented by photographs, some oil stains were observed around the solids removal facility. According to the operator present during the site visit, snow is removed from Pad 3 and deposited on adjacent tundra without sampling the snow for the presence of spilled material.

According to ARCO personnel interviewed during the site visit, there is no cathodic protection for the injection wells at this facility, and no H_2S detection or warning devices were being used at the time of the site visit. Since the EPA contractor site visit, as observed by EPA personnel visiting the facility in August of 1988, H_2S detection and warning devices have been put in place.[9] (Refer to photos 25-30.)

As mentioned earlier, public comments submitted to EPA from the Trustees for Alaska on the operator's application for Class I status at Pad 3 provide information that raises issues concerning the performance and integrity of the Pad 3 disposal facility. EPA has not confirmed the facts alleged by the Trustees, and includes major points provided by the comments to indicate the nature and extent of the problems which may exist at this facility. These comments were prepared by a former senior production engineer who worked for ARCO for a number of years on the North Slope, and many of the comments are based on actual experience at the Pad 3 facility and at numerous other oil production facilities in operation on the North Slope. As discussed in the comments, this former senior production engineer had access to data maintained by ARCO pertaining specifically to the Pad 3 facility and to the surrounding area.

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9 H_2S concentrations of 600 ppm are fatal to humans.

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One of the issues raised by these comments concerns the volumes and types of wastes to be disposed at Pad 3 (Trustees 1988; Trustees 1988a). As stated by the comments: "The volume of waste proposed for injection at this facility over the next 10 years is approximately 30,000,000 barrels. This is ten times more than has been injected in the past 12 years." This projected volume would result in disposal of approximately 10,000 barrels of waste per day at Pad 3. The comments point out: "The transport of 9,000-10,000 barrels per day of waste to Pad 3 will require 60-70 150 barrel truckloads per day. This [is] a truck every twenty minutes or so around the clock. The waste manifesting and control system presently in use by ARCO is incapable of controlling this volume of waste."

The North Slope oil fields are becoming sour fields. As stated in the public comments submitted by the Trustees: "The Prudhoe Bay Field is becoming a sour field, saturated with increasing concentrations of hydrogen sulfide (H_2S), since the inception of the waterflood project in 1984. Concentrations of H_2S approaching 1,000 ppm are now found in numerous process vessels in North Slope facilities. These vessels contain sludge, saturated with H_2S and sulfate reducing bacteria, which is eventually disposed of at Pad 3....These materials will present significant processing problems at the Pad 3 facility and may have destructive effects on the injection wells and receiving aquifer."

The comments go on to address concerns about the current location of the Pad 3 facility: "The single most pressing problem with the present siting of the OWIF [Oily Waste Injection Facility] is its close proximity to ARCO Drill Site 6. It appears probable, indeed almost certain, that wastes injected at Pad 3 have invaded the area beneath the permafrost under Drill Site 6. This waste is or will soon be in contact with Drill Site 6 well bores between the 1,900 and 2,300 foot depth and for some distance above and below this area." Table C-1 of Attachment A of ARCO's permit application identify several wells within 550 feet of the Pad 3 wells, and one as close as 440 feet.

In addition to concerns over the proximity of Pad 3 to Drill Site 6 wells, several monitoring wells were drilled within 300 feet of the injection wells at Pad 3. According to the Trustees' comments: "According to AOGCC files, closure was effected on these wells by welding a steel plate over the casing." Under current Underground Injection Control (UIC) regulations, wells must be plugged using cement plugs in critical intervals; welding a steel plate over a casing is not considered a safe and adequate method for plugging a well.

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The Trustees' comments go on to address concerns about the ability of permafrost to contain the waste injected at Pad 3: "The containment of the injected fluids at Pad 3 ultimately depends upon the integrity of the overlying permafrost. The binding agent for the soils within the permafrost is ice. The fluids injected at Pad 3 consist of a large portion of antifreezes or freeze depressant fluids such as methanol, ethylene glycols, diesel fuels and natural gas liquids. Many of these are lighter than water and will rise to the area immediately beneath the permafrost. Thawing of the permafrost in this area has been occurring and will continue."

The Trustees' comments discuss many concerns pertaining to the physical integrity of the injection wells. According to a portion of the comments: "The wells were drilled as permafrost test wells fifteen years ago, and were never intended or designed for waste injection. Their use for waste disposal in the past may have diminished whatever life expectancy they had....the Pad 3 wells have a single wall tailpipe over the last 200 feet or more of the well depth. It is possible that this tailpipe may no longer exist due to corrosion from previously injected wastes."

As stated above, the comments submitted to EPA Region X on the application for Class I status at this injection facility are included here to illustrate the nature and extent of possible problems which may exist at this facility. These comments have not been confirmed or refuted by ARCO or Standard. The permit application for Class I status at this facility is pending.

Site # 7 ARCO's Pingut Pit

Pingut pit is an abandoned, deep, below-grade reserve pit that was first used to dispose of drilling wastes, and later operated by ARCO as an oily waste pit. The pit was used for the containment of liquid wastes from approximately 1976 to 1986. Liquid wastes stored here included tank washing wastes, production separator sludge, natural gas liquids, oil-based drilling muds, lost circulation material waste, workover wastes, and pigging wastes. According to ADEC test results, one sample taken at the site in 1986 indicated the presence of benzene and toluene in a total concentration of 800 ppm. The pit has undergone closure as described later in this section. The pit was approximately 9 feet deep, was never lined, and no leak detection system was ever used. Incoming wastes were never

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characterized prior to disposal. On June 11, 1986, during a general inspection of the area, an ADEC official documented that oil-contaminated water was overtopping the secondary containment dike around the pit, and a large quantity of crude oil was floating on the surface of the pit. At this time, ADEC advised ARCO of the situation.

On subsequent inspections of Pingut Pit in July of 1986, ADEC officials discovered that conditions at the pit had not changed. On July 29, 1986, ADEC issued ARCO a Notice of Violation for the oily waste discharges at Pingut Pit. According to the letter from ADEC to ARCO accompanying the Notice of Violation, the oily waste discharge was a violation of State Regulation 18 AAC 72.210, and that "containment by the pit is inadequate for an oily waste disposal storage site" (ADEC 1986).

The ADEC letter states: "No permits have been issued for operation or use of this facility and its location is such that any hydrocarbons or contaminants that escape from the pit will go directly into the Sagavanirktok River floodplain. The Department of Fish and Game has shown great concern about this occurring." The letter goes on to state: "Any pit that is used for storing oily waste must go through plan review and demonstrated to be impermeable. A disposal permit may also be required. The pit at Pingut has never received plan approval or a permit." The Notice of Violation requested a close-out plan and schedule for completing close-out (ADEC 1986a).

Prior to closure, the pit contained 1 to 2 feet of oily sludge on the floor of the pit. Chemical analysis of the sludge provided to ADEC by ARCO on February 9, 1987, showed oil and grease levels in wet samples ranging from 0.3% to 12.6%. Oil and grease levels in dry samples ranged from 0.4% to 15.5% (ARCO 1987).

Freeze-back was the closure method chosen by ARCO and approved by ADEC for the final closure of this pit. According to ARCO's close-out plan for the pit, the bottom of the pit was covered with 2 to 3 feet of gravel followed by 6 to 7 feet of overburden. Overburden material used to close the pit was the material used in the surrounding dikes prior to closure. According to analysis performed by ARCO on the overburden material used to cap the pit, purgeable aromatic hydrocarbons were found in all samples taken at six stations and at different depths in the overburden. At a depth of 2 to 3 feet, purgeable aromatic hydrocarbon content ranged from 5.5 ppb to 69.9 ppb. At 4 to 5 feet of depth, purgeable aromatic hydrocarbon content ranged from 0.0 ppb to 295.0 ppb. At depths

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ranging from 6 feet to 11 feet; purgeable aromatic hydrocarbon content ranged from 6.4 ppb to 110.8 ppb. Oil and grease content of the samples ranged from 8 ppm to 58 ppm. According to ARCO, the final two feet of overburden used to cap the pit was uncontaminated (ARCO 1987a). However, based on existing information, ADEC is unable to verify this.

Prior to closure, the oily waste that had escaped from Pingut Pit during the summer of 1986 was not recovered, and the surrounding area of the pit was never monitored for residual contamination. At the time of close-out, thermistors were placed in the pit to monitor temperature. According to ARCO's closure plan, the overburden cap would be graded to a final slope of approximately 1% to facilitate drainage. The plan goes on to state: "The lack of erosion concern also indicates a revegetation effort is not necessary." At the time of the site visit, the area where the pit was located was covered with overburden and leveled in a tidy manner. (No photos were taken of this site.)

Site # 8 Old Surfcote Landfill - ARCO Fire Training Facility

ARCO currently uses the old Surfcote landfill site as a fire training facility. The landfill was closed in 1979-1980. The Surfcote landfill was ARCO's primary disposal location for industrial wastes generated by North Slope oil field operations prior to the opening of the Oxbow landfill. According to ADEC, the State does not have good records of what was disposed at this site or other sites during the late 1970s and early 1980s. However, it is recorded in ADEC records that the Surfcote site was used for the one-time burial of an estimated 9300 to 20,000 cubic yards of scrap metal in 1980 under a solid waste disposal permit from ADEC. The waste, estimated to be approximately 3,000 to 6,000 tons, included approximately 500 to 600 tons of crushed drums which were judged to be unacceptable for scrap metal recycling because they contained residues.

According to ARCO personnel interviewed during EPA's visit in August, during the staging of fire fighting exercises at this facility, diesel, other flammable liquids or natural gas are ignited on various props at the facility. After the fire is extinguished the oily waste runs off into a lined collection pit. At the time of EPA's visit, it was not apparent whether the entire pad is lined or just the pit area. There was a visible sheen on the pit surface and oily liquids had flowed across the gravel pad as evidenced by an oily residue

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on the pad. Several unlabeled drums of oily waste were located on site at the time of EPA's visit in August. As stated by ARCO, the practice of using liquid oily wastes at this facility is being phased out.

Site # 9 ARCO Drill Site 4

ARCO's Drill Site 4 is typical of most drill sites on the North Slope where production and enhanced recovery wells are placed around the perimeter of a large, unlined gravel reserve pit. Gathering lines are run over and around the reserve pit.

ARCO Drill Site 4 has experienced repeated problems with soil and sediment contamination on the west side of the drill site. According to an ADEC letter dated July 22, 1988, an oil spill at Drill Site 4, near Sump 1 was first observed by ADEC on August 4, 1987 (ADEC 1988). On August 12, ARCO filed a spill report with ADEC stating that the spilled material consisted of approximately ten gallons of diesel fuel (ARCO 1988d). The spill was cleaned up, and according to ARCO, no additional contamination was noted prior to freeze-up.

On June 16, 1988, this site was visited by the EPA contractor accompanied by ADEC personnel. At that time, it appeared that material containing a dark, oily substance had leached from the reserve pit, under the road on the west side of the pad, and into the tundra on the west side of the road. At the time of the site visit, the water around the tundra on the west side of the road was covered with an oil sheen, and the same oily material had flowed onto the tundra. According to ADEC officials, in 1987 and 1988 ADEC had requested three times that ARCO perform adequate cleanup at this spill site.

On July 22, 1988, ADEC issued ARCO a Notice of Violation for failure to perform adequate cleanup on the Drill Site 4 diesel spill (ADEC 1988a). According to the letter accompanying the Notice: "Several inspections of the site have been made by department personnel since ARCO personnel reported that the contamination had been cleaned up. Oil was found on the north side of the north dike of Sump 1 and in the sediment in the impoundment immediately north of the dike during each of these inspections. In addition, water in the impounded area has had a sheen on it during each site visit and the area has a diesel smell."

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The letter goes on to state: "The original oil spill report states that 10 gallons of diesel were spilled. The size of the contaminated area and severity of contamination appears to be more than could be caused by 10 gallons of diesel, especially if some site cleanup has already occurred. Another source of contamination may exist, such as the dike itself. As stated in the Notice of Violation, the extent and severity of contamination must be determined and the methods of determination and results reported to the department by August 5, 1988."

In ARCO's response to ADEC's Notice of Violation dated August 22, 1988, the company states: "ARCO Alaska, Inc. denies the allegations of the State of Alaska, Department of Environmental Conservation that it unlawfully failed to clean-up oil-contaminated gravel and soil on a dike and impoundment on the north end of Drill Site 4. ARCO also denies the allegation that it falsified information required by 18 AAC." ARCO also stated in the response: ..."ARCO requests that ADEC withdraw the Notice of Violation dated July 22, 1988." The response also discusses in detail cleanup procedures that had been employed and data on levels of hydrocarbon contamination found in the adjacent dike and surrounding area (ARCO 1988d).

According to ADEC, as of October, 1988, ARCO has achieved containment of the spill to the satisfaction of the Department. Cleanup of the spill area is being accomplished in conjunction with closeout of the reserve pit on the drill site. (No photos of this site were taken.)

Site # 10 ARCO's Crude Oil Topping Unit

ARCO operates the crude oil topping unit used to make fuel for the many vehicles used on the North Slope. The unit was one of the first permanent installations built on the North Slope during the initial development of the Prudhoe Bay field. The topping unit is a small petroleum refinery that breaks out the diesel fraction of crude oil. According to ARCO personnel, jet fuel also was made at the topping unit in the past.

The site generates various waste streams including water distilled off the crude oil, sulfur from H_2S removed from crude oil, vessel bottoms (tank bottoms), heat exchanger bundle sludges (generated when the plant pipes are flushed with diesel), and solvents used for cleaning the vessels and heat exchangers. According to ARCO personnel on site, the

vessel bottoms are removed every 2 years, while the bundle sludges are removed every few months, and to date are disposed at the Pad 3 facility.

According to the facility operator interviewed during the site visit, the bundle sludges have failed the EP-toxicity test for chromium and the RCRA characteristics test for ignitability. In information submitted to EPA by Standard subsequent to the EPA contractor visit, the statement is made (Standard 1988): "Heat exchanger bundle sludges from the topping unit are not exempt wastes and are not currently handled at the Pad 3 Oily Waste Injection Facility." In information submitted to EPA by ARCO subsequent to the EPA contractor visit, the statement is made (ARCO 1988): "ARCO has not deemed the material to be hazardous waste - testing to date has in fact shown the material to be well below EP toxicity criteria for chromium and other contaminants."

To date no documented shipment of bundle sludges has been made to a RCRA permitted facility. According to ARCO's most recent RCRA biennial report, dated 1985, the heat exchanger bundle sludges were disposed at Pad 3 injection wells. Standard and ARCO state that disposal of topping unit bundle sludge ceased at Pad 3 in August, 1985 (ARCO 1988; Standard 1988). ARCO's latest RCRA biennial report has not been released, and based on currently available information it is not possible to determine how the bundle sludges have been disposed since 1985.

The topping unit may generate wastes identical to wastes listed under RCRA has hazardous when generated by petroleum refineries. These wastes include K048 through K051; K048 is described as "DAF" or dissolved air flotation float; K049 is slop oil emulsions and solids; K050 is heat exchanger bundle sludges and cleaning wastes; and K051 is API separator sludge. ARCO does not have an EPA generator number for this facility; however, ARCO does have an EPA generator number for the numerous facilities in ARCO's Prudhoe Bay Unit - Eastern Operating Area.

Pad 3 is used as the disposal facility for most wastes generated at the topping unit. Officials with ADEC are investigating allegations that the flare pit behind the topping unit has been used in the past to burn many of the wastes generated at this facility. Sampling of this flare pit was to be performed by ADEC during the summer of 1988 to establish if wastes exhibiting RCRA hazardous characteristics have been disposed of in this pit. Currently, results from sampling this flare pit are unavailable.

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ARCO maintains a diesel fuel storage facility adjacent to the topping unit. It was noted during the site visit that portions of the berm surrounding the large storage tank appeared to be saturated with oil. (Refer to photos 100-104.)

Site # 11 ARCO Pad 14

ARCO's Pad 14 is an oil and gas production facility that includes a manifold building (some rough separation occurs here), a reserve pit, a relief pit, and a pigging pit. The relief pit, which is located on the far edge of the pad adjacent to the tundra, is made of unlined gravel berms. When gas pressure in facility vessels becomes too great, the gas is vented to this relief pit, which is similar to a flare pit in design and construction. As documented by photographs, oil sheens and spillage were evident on the surface of this pit. It is not known whether the pit was used to dispose of other wastes.

Relief pits and flare pits on the North Slope are generally unlined and constructed with gravel. According to ADEC, relief pits commonly receive liquid carryover from the venting process. Further, no formal sampling or survey has ever been performed on the relief pits. Field engineers with ADEC have personally inspected most all relief pits on the North Slope, and as observed at ARCO Pad 14, have seen oil slicks in many, oily rings around the inside wall of relief pit berms, and evidence that the relief pits leak. According to ADEC, none of these relief pits have liners.

The pigging pit at ARCO Pad 14, which is located near the main structure, is lined with an asphalt material. The pigging pit collects sludges and debris from pipeline cleaning operations. Wastes generated by the pigging procedure are removed by vacuum truck and hauled to the Pad 3 oily waste disposal facility or hauled to the Oxbow landfill.

According to ARCO in information submitted following the EPA contractor site visit (ARCO 1988): "The "pigging pit" is an emergency pit, which is lined with a Chevron Industrial Membrane liner. The emergency pit is used only to collect sludges and debris from water injection pipeline operations. Lines do not carry hydrocarbons, therefore no solvents are introduced into the pipeline prior to pigging operations..." (See photos 128, 129, and 152.)

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SITE DESCRIPTIONS - STANDARD ALASKA PRODUCTION COMPANY

Site # 1 Standard's Hazardous Waste Storage Site

Standard operates a hazardous waste storage area on C Pad in the Western Operating Area. The types of hazardous wastes stored at this facility include off-specification fuels and solvents, waste corrosion inhibitors, unidentified wastes found in 55-gallon drums, and laboratory wastes.

The site consists of a below-grade gravel pit that is surrounded on three sides by gravel berms. The 55-gallon drums are placed inside overpack drums as a method of secondary containment. The overpack drums are stacked, two (2) high, on wooden supports. According to Standard personnel interviewed during the site visit, after an unspecified volume of wastes are collected, a shipment will be made to an appropriate RCRA Subtitle C TSD facility in the Lower 48 States. According to ADEC, Standard has an EPA generator number for their North Slope operations, and has an interim status permit for container storage of RCRA hazardous waste at this site.

The bermed area containing the stored drums is unlined. Storm water that collects in the bermed area is injected down a Class II disposal well, according to Standard personnel. Chemical analysis is not performed on this storm water prior to injection.

Standard's waste lubrication oil storage tank is located adjacent to the hazardous waste storage area. The tank is surrounded by a separate gravel berm for spill containment. The bermed area around the waste lube oil tank is lined. According to information submitted by Standard following the EPA contractor visit, incoming waste oils are chemically analyzed for parameters required by the used oil criteria in 40 CFR Part 266 (metals, flashpoint, and organics). Analysis is performed by Chemical and Geological Laboratories in Anchorage. The waste oil is shipped to Chemron, a waste oil recycler in Palmer, Alaska (Standard 1988). According to ADEC, the area around the waste oil tank

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was used for a short period of time as a landfill for incinerator ash. (Refer to photos 31 and 32.)

Site # 2 Standard's Santa Fe Pad Drum Cleaning and Crushing Operation

A drum cleaning and crushing building is located at Standard's Santa Fe Pad. Standard's oil field operations produce large quantities of empty drums that are sent to this facility for cleaning and crushing. Drums may contain residues of biocides, pesticides, corrosion inhibitors, a variety of solvents, emulsion breakers, reverse emulsion breakers, glycol, alcohols, xylenes, diesel, and various other oil field chemicals, along with dead crude and diesel collected from well returns. Employees working in this facility wear Level C respirators and protective clothing.

Drums are brought to the facility by truck. The condition of the drums varies; some are in good condition, while others are damaged, corroded, or rusted. If a drum contains a sizable quantity of liquids, its contents are removed by vacuum truck. Solids in the bottom of the drums are removed by hand. Drums are then rinsed in a drum rinsing machine, which sprays jets of warm water into the drum. The rinsate is flushed into a 500-gallon collection tank inside the building. The rinsed drums are then crushed by an on-site drum crusher. All solids generated during this process, including the crushed drums, are sent to the Oxbow landfill. EPA believes that cleaning of drums prior to disposal as described above is a desirable waste management practice.

According to Standard (Standard 1988): "All rinsate collected from the Santa Fe Warehouse is sent to SAPC's Gathering Center 1, where the material is recycled through the processing system, recovering oil to the crude stream. Any water residuals retained in the wastewater system are commingled with produced water for underground injection."

At the time of the site visit, no secondary containment was provided for the area where incoming drums are stored, and the gravel area around the facility building showed evidence of oily stains. (Refer to photos 33-38.)

Currently, Standard and ADEC do not agree on what Federal environmental regulations apply to this facility. As ADEC points out in a memo dated October 13, 1988 (ADEC 1988b): "40 CFR 261.7(a) (1) [RCRA] provides that any hazardous wastes

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remaining in empty containers or empty container inner liners, as defined by 261.7(b), is not subject to the regulation under Parts 261-265, 268, 270, or 124 of 40 CFR or Section 3010 of RCRA. However, when these residues are removed from empty containers, such as occurs when drums are washed out, a new waste is generated, which is subject to RCRA [Subtitle C] regulation as a characteristic hazardous waste. This provision is discussed in the August 18, 1982 Federal Register on page 36096..."

In information submitted to EPA subsequent to the EPA contractor site visit Standard states that (Standard 1988): "Empty drums received at the Santa Fe Pad Warehouse are from well site locations and have been used for well returns, which consist largely of dead crude and diesel. Minute quantities of other exempt production chemicals would be found as drum residues at this facility. The residues from these drums are not regulated as hazardous waste under Subtitle C of RCRA. Residues that are regulated as hazardous waste are those collected from drums that contain "commercial chemical products" ("U" or "P" listed wastes) [40 CFR 261.33(c)]. Any solid waste residues collected from drum rinsing operations at Prudhoe are not in the category of spent commercial chemical products."[1]

Site # 3 Standard's Gathering Center 3

ARCO and Standard operate large collection and separation facilities on the North Slope to separate the oil/water/gas from all fluid produced in the Prudhoe Bay field.[10] After separation, much of the water and natural gas is reinjected into the producing formation, while the oil is sent to the Aleyska Pipeline. All of the flow stations and gathering centers combined process approximately two million barrels of oil per day, along

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[1] Standard is correct in stating that only residues from "U" or "P" listed wastes are regulated as hazardous. However, all rinsate generated by rinsing drums containing any commercial chemical product is subject to regulation under RCRA Subtitle C as a characteristic hazardous waste. Further, production chemicals are exempt from regulation under RCRA Subtitle C only after they have entered the oil and gas production process and are spent. Unused, discarded production chemicals are never exempt from regulation under RCRA Subtitle C when generated by any aspect of oil and gas exploration, development, and production. In addition, wastes generated by such activities as equipment maintenance, painting, and pesticide storage associated with North Slope oil and gas production are not exempt from regulation under RCRA Subtitle C.

[10] ARCO refers to these facilities as "flow stations," and Standard refers to them as "gathering centers."

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with equally large volumes of produced water and natural gas. The facility toured had a very clean and orderly appearance.

These facilities generate a variety of wastes. Precipitates and sludges from collection and separation vessels are removed periodically.[11] Corrosion inhibitors and biocides are added to these vessels periodically to prevent corrosion from H_2S and sulfate-reducing bacteria. As stated by a Standard employee operating Gathering Center 3, thousands of barrels of collection and separation vessel precipitates are removed annually.

As the Prudhoe Bay field grows older, it is anticipated that more solids will be inherently present in the production stream. This will increase the frequency of vessel cleanouts and thus produce more and more precipitate waste. The precipitate wastes are disposed of at the Pad 3 facility. According to Standard personnel operating Gathering Center 3 at the time of the site visit, chemical analysis is occasionally performed on collection and separation vessel precipitates, and the metals commonly found include lead and chromium.

Glycol is used in large quantities to heat the oil emulsions during the separation process. The glycol is continually filtered using sock filters or charcoal filters, which are sent to the North Slope Borough incinerator for disposal. (Charcoal filters are used to remove chlorinated hydrocarbon contaminants from the glycol. The glycol itself is usually regenerated by stripping the water out through a heat process. The resulting water is released to the atmosphere as steam.)

"Dirty water" tanks are present at these facilities. These tanks indirectly receive flow-back from well stimulation, workovers, and completion operations through the train separators. Standard's Gathering Center 1 receives the rinsate generated at the Santa Fe Pad drum cleaning facility. Both solids and liquids are recovered in these tanks. The liquid portion of this waste is disposed of through injection wells located on site, while the solids are disposed of at the Pad 3 oily waste pit.

Each separation facility has large reserve pits or emergency pits. According to the operator interviewed during the site visit at Gathering Center 3, the pits are for containment

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[11] This precipitate and sludge is similar in nature to tank bottoms.

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of spillage from fire suppressant systems. The medium in these systems is usually water, water mixed with fire-retardant chemicals, or proprietary chemicals. At Gathering Center 3, the separation facility toured, these reserve pits contain red-colored algae that are striking in appearance. (Most algae in the North Slope is not red in color.) Site personnel do not know the cause of this algae growth. According to information submitted by Standard subsequent to the EPA contractor visit (Standard 1988), these pits are used to provide containment of a large spill of crude oil released in the event of an accident in the gathering facility. (No photos of this site are available because cameras are not allowed inside these gathering facilities.)

Site # 4 Standard's Base Operations Camp Sewage Treatment Plant

Standard has one of two NPDES permits in the Prudhoe Bay oil production area for discharge of treated sewage. Sewage from the Base Operations Camp is treated at the sewage treatment plant and treated effluent is discharged directly to a nearby tundra lake. The treatment facility has the following primary and secondary treatment capabilities: primary screening, trickling filters, extended aeration, clarification, chlorination, sludge conditioning, sludge thickening, and incineration. Effluent discharged from this facility must meet secondary standards. According to Standard, a lab at the facility monitors the plant effluent daily. Solids are incinerated on site. (Refer to photos 39-40.)

Site # 5 Standard's Y Pad Drill Site

Standard's Y pad is a typical drill site in the Prudhoe Bay field, in that production and injection wells are arranged around a reserve pit, which is used to contain muds and cuttings from development drilling on the pad. Production and injection piping cross the reserve pit in a number of places. The reserve pit is constructed above grade, and during the site visit, as documented by photographs, the pit appeared to have little (less than six inches) freeboard. Much of the contents observed during the site visit consisted of snow melt that would eventually be removed by dewatering over the 1988 summer season.

At the time of the site visit, development drilling was under way and water-based mud and cuttings were being discharged to the reserve pit. Other unidentified wastes had also been placed in the reserve pit. Some of these substances appeared to have an oily

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composition, while others appeared to contain a thick, beige substance swirled in oil. At the time of the site visit, it was hypothesized that the oily substance observed could be workover or completion fluid. According to information submitted by Standard subsequent to the EPA contractor visit (Standard 1988): "...the substance seen was from oil-based muds which had been previously deposited during development drilling and not from a workover or a completion or stimulation. At the time of the [EPA contractor] visit, water-based muds were being discharged to the pit from the rig on the well pad. It is important to note that SAPC recently decided not to discharge any more oil-based muds to reserve pits, even though this practice is allowed."

Under the new drilling waste regulations recently promulgated by the State of Alaska, reserve pit disposal of drilling waste can include such wastes as oil-based drilling muds, workover fluids, acids, hydrocarbons, and brine, assuming that the reserve pit is fully lined.[12] In permit applications for disposal of drilling wastes in reserve pits, the applicant must list by type and by volume all wastes to be disposed. According to ADEC, Standard has never mentioned the disposal of oil-based muds or workover fluids or other wastes in any of their permit applications, and because of the absence of a request to dispose of oil-based drilling muds or other oily wastes in Standard's permit applications, ADEC's review of Standard's reserve pit permit applications has not included inquiries concerning workover fluids or other wastes except water-based muds and cuttings. According to ADEC, all permits issued to date limit reserve pit disposal of drilling wastes to water-based muds and cuttings only. For example, in Appendix A of ADEC Permit 8736-BA008, Section II, paragraph D it is stipulated that the permittee will "Limit disposal to the pit to water-based drilling muds and cuttings."

According to wetland permits issued to Standard and ARCO by the Army Corps of Engineers for construction of reserve pits in arctic wetlands under Section 404 of the Clean Water Act (U.S. Army Corps of Engineers 1986): "...reserve pits shall be rendered impermeable. Permafrost alone is not a sufficient barrier. Hydrocarbons discharged into relief pits, flare pits, or reserve pits shall be removed and properly disposed of as soon as practicable during the winter but before spring breakup and within 72 hours of discovery

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12 According to ADEC, the new drilling waste regulations recently promulgated by the State of Alaska require that reserve pits be lined when they are constructed. This is very different from the old regulations that had no requirements for liners.

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during periods of thaw." As stated by ADEC, placement of any hydrocarbons, such as oil-based drilling muds and cuttings in reserve pits conflicts with the Army Corps of Engineers' requirement that they be removed within 72 hours of discovery during periods of thaw.

In a related case, on July 22, 1988, Standard received a Notice of Violation from ADEC for a permit violation involving the disposal of oil based drilling wastes in a reserve pit at W Pad. According to the letter from ADEC to Standard accompanying the Notice of Violation (ADEC 1988c; ADEC 1988d): "The incident involved the disposal of oil based drilling wastes in the south reserve pit at W Pad. Permit Conditions A.II.D and A.II.E of Solid Waste Disposal Permit 8736-BA007 specifically prohibit such disposal. In addition a field visit revealed that a copy of the permit was not available at the facility as required by Condition B.IV, and that the sampling designs for the "toe" samplers had not been submitted as required by Condition A.II.H." According to ADEC, the storage of oil based muds in the W Pad reserve pit resulted in a release of oily material to the tundra.

The ADEC letter goes on to say: "SAPC has proposed an overall drilling waste management plan (dated March 18, 1988) which relies heavily on fluid management as a main barrier to contaminant migration. Although the reserve pit at W Pad is lined to a large extent, none of the reserve pits presented in SAPC's plan are totally lined. Violations of the type occurring during July 10-14 are of particular concern when unlined pits are involved. It is requested that SAPC reevaluate their drilling waste management plan and consider total lining of all active reserve pits." In its reply to the Notice of Violation issued for W Pad dated July 15, 1988, Standard states that the oily waste deposited in the reserve pit was removed and disposed at the Oxbow oily waste pit (Standard 1988c).

According to information submitted by Standard to EPA following the EPA contractor visit (Standard 1988): "SAPC [Standard] suspended discharging oil-based muds to reserve pits pending the results of the extensive monitoring program SAPC is conducting to ensure that the pits are providing proper containment." Standard goes on to state that "SAPC no longer uses reserve pits for disposal of oily workover wastes, which are now either disposed of in Class II injection wells or are recycled through the production process." According to ADEC, discharges of any workover waste or oil-based drilling fluid has been and is currently a violation of all past and current reserve pit permits issued by ADEC to Standard. According to ADEC, it lacks adequate information on

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characterization and volume of workover fluids generated as Standard has never included a request to dispose of workover wastes in a reserve pit permit application.

At the time of the site visit, breakup was under way and substantial quantities of snow had not yet melted in the reserve pit at Standard's Y Pad. According to industry and ADEC personnel, sn is routinely removed from the surface of the pads at breakup each year and, in many instances, is deposited on adjacent tundra. Since crude oil spills and chemical spills are common during the winter months, the potential exists for spilled material to remain in the snow that accumulates on the pads and thereby be transferred to the tundra. However, ADEC requests that the operators only remove snow down to the last foot and the State designates specific snow disposal areas adjacent to the drill sites. (Refer to photos 41-47.)

Site # 6 Standard's East Dock Pits

The East Dock facility is located on the eastern shoreline of Prudhoe Bay approximately 3 miles southwest of Heald Point and 2 miles west of the westernmost channel of the Sagavanirktok (Sag) River. The three-celled reserve pit was constructed in 1980 and was used for disposal of muds and cuttings from off-shore drilling activities during the 1981 and 1982 exploration drilling seasons. Two of the cells received mud and cuttings, while the third cell received treated sanitary wastes from the East Dock camp.

Construction permits issued for the reserve pits in November 1980 stipulated that Standard would design and conduct a monitoring program to test the impermeability of the sump design over a five year period. Two preliminary reports of results were submitted in 1984 and 1985, and a final report was submitted in 1986. According to Standard, the report concluded that no adverse environmental impact to the surrounding area was observed.

On July 27, 1984, Standard wrote a letter to ADEC to inform the Department of the recent dike leakage incident at the East Dock reserve pit (Sohio 1984). The letter states that "On July 23, 1984 Sohio [Standard] personnel discovered significant leakage of the reserve pit dike in cell No. 2..." The letter also discusses Standard's plans for correction of the problem.

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ADEC replied to this incident with a letter to Standard dated August 28, 1984 (ADEC 1984a). The ADEC letter states that: "Leakage of the dike and review of department records has raised several concerns by the department." The letter goes on to state: "The authorization [to use the East Dock area as a mud sump] was limited to a three year period. During that three year period Sohio was to develop a plan for the ultimate disposal of off-shore generated drilling muds and cuttings. The plan has not been received by the Department." The ADEC letter also states: "The dikes [around the reserve pits] were to be impermeable. Your recent notification of leakage indicates failure to comply with the permit condition requiring an impermeable dike."

The ADEC letter goes on to state: "The Department of Army permit [Army Corps of Engineers] required Sohio to design and conduct a monitoring program to test the impermeability of the mud sump design. Annual reports of the monitoring program were to be submitted to the District Engineer and made available for review by Federal and State agencies. The department is not aware of any ongoing monitoring program conducted by Sohio. To date the department has not received the "annual reports" of the monitoring program. By way of this letter the Department is requiring the final closure of Sohio's East Dock Reserve Pit facility. Please submit final closure plans."

According to information submitted by Standard to EPA following the EPA contractor site visit, a final approval to proceed with the close-out of the East Dock pits was received from ADEC on August 7, 1987 (Standard 1988). Gravel was placed in the two mud-containing sumps in late August of 1987, and sampling monitors and thermistors were installed. According to Standard, thermistor measurements and water quality samples were taken during the summers of 1987 and 1988. Standard states: "A report of the results from the 1987 sampling will be submitted to ADEC prior to October 1, 1988." However, ADEC informed EPA that as of October 14, this report had not been submitted.

According to Standard, the East Dock pit closure is a test for proposed closure and revegetation techniques eventually to be used for the North Slope fields. ADEC notes that, generally revegetation has not been tried on a large scale, and a standard, practical method of doing so has not been developed. The methods and technology for large-scale revegetation is unproven. While the closed site of the East Dock Pits has not been revegetated, at the time of the EPA contractor site visit, the pit closure activities had left the area with a tidy appearance. (No photos were taken of this site.)

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Site # 7 Standard's G Pad

Standard's G Pad is an oil and gas production facility that has one main structure, where oil and gas are separated, and a large unlined reserve pit. At the time of the site visit, an extensive oil sheen was observed on the surface of the reserve pit. According to ADEC, this pit overflowed on August 4, 1987 and discharged 50 cubic yards of drilling muds and cuttings to the tundra. At the time of the site visit, the pit appeared to have been leaking as evidenced by dead tundra adjacent to the pit. The area that appeared to have experienced seepage of contaminants at the time of the site visit was not the same area impacted by the release of drilling waste in August of 1987.

Drilling muds and cuttings, water and drilling fluids, and other debris are stored inside the reserve pit. In the spring of 1988, Standard removed 8,500 cubic yards of drilling muds and cuttings from the G pad reserve pit and disposed of this material at the Oxbow landfill. Fluids in the reserve pit were disposed of via annular injection.

Subsequent to the EPA contractor site visit, Standard submitted additional information concerning the 1987 spill (Standard 1988): "On August 4, 1987, SAPC reported a spill of approximately 50 cubic yards of drilling fluids which overtopped the reserve pit walls at G Pad. The area was sandbagged and a plastic liner placed on the tundra to prevent further spreading during cleanup. The area was flushed with water which was pumped back to the reserve pit and later disposed of by annular injection. Water samples were taken to ensure that nearby tundra ponds were not affected, and restoration and dormant reseeding occurred in 1988. The area will be monitored in 1989 to ensure regrowth of tundra grasses, and additional restoration measures will be undertaken if necessary. During the summer of 1988, liners were installed in parts of the G Pad reserve pit walls where leakage was suspected."

ADEC states that, to date, it has not had the manpower to monitor and follow up on this site. (This site is documented in photos 144-148).

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Site # 8 Standard J Pad

Standard's J Pad is similar in design and operation to Standard's G Pad. On August 5, 1987, Standard received a Notice of Violation from ADEC for disposal of oily wastes in the reserve pit, and seepage of oily wastes from the reserve pit onto the nearby tundra. According to the letter accompanying the Notice of Violation (ADEC 1987; ADEC 1987a):

"Three different reserve pits in SAPC's Prudhoe Bay Western Operating Area have been used in recent months for the disposal of oily wastes; including J-Pad, G-Pad, and most recently N-Pad. Deposited oily waste has often originated from spills at locations other than the pad where the materials have been disposed. In addition to the expected crude oil, materials or material matrices deposited in these pits have included diesels, hydraulic fluids, light condensates, lube oil, and glycols. The attached Notice of Violation relates to activities which have occurred at J-Pad only, primarily because J-Pad has been an ongoing problem and leakage from the north pit has been documented. Multiple department inspections of the J-Pad reserve pit since breakup have revealed the continuous presence of hundreds of gallons of pooled crude and lighter [oils] and product within the pit. Several complaints from other state, federal, and North Slope Borough inspectors have also been registered with the department." In spite of its identification of these alleged violations, however, ADEC states that it lacked the necessary enforcement staff during the 1988 summer season to monitor and follow up on the oily waste disposal incident at N Pad.

ADEC's letter goes on to state: "It is recognized that discharge of some crude oil into a reserve pit is a natural outcome of drilling into producing formations; however, these liquids must be removed in a timely manner so as to prevent their leaching from the pit. These are the only hydrocarbons that may be allowed to be discharged into a reserve pit."

The letter also asserts that in the spring of 1987 Standard had agreed to develop an appropriate alternative to depositing oily waste in reserve pits: "...it was agreed that SAPC would be allowed a grace period in order to develop a more appropriate alternative to depositing oily waste in reserve pits. In the interim, it was agreed that contaminated materials not directly related to drilling would no longer be placed in the pits, and that aggressive fluid management would be practiced in order to prevent escape of

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contaminants. As of July 21, 1987 both hydrocarbons and water were still present in the pit, aggravating the leakage through the pit wall."

The Notice of Violation states that Standard must provide ADEC with a conceptual plan for long-term disposal of oily wastes, other than in a gravel diked reserve pit. The plan was to include a proposed timeline for completing the storage facility and plans for interim disposal of oily wastes while a permanent facility was being designed and constructed. Standard responded to the Notice of Violation by letter, stating (Standard 1987): "SAPC will develop a final plan for the containment and disposal of oil wastes by September 30, 1987 and construct these facilities in 1988. Conceptually, this plan will be a containment facility designed to ensure adequate containment of any liquids and facilities to inject residual liquids. During the interim period until these facilities are designed and constructed, all non-liquid oil spill cleanup material will be placed in G and/or J Pad flare pits. G and/or J Pad flare pits will be lined with an impermeable liner prior to use and will be used until the permanent facility is complete." ADEC states that it has never issued a letter or other document that approved of the placement of spill material or oily waste in a flare pit. Instead of constructing an oily waste disposal facility as discussed in Standard's letter, Standard continues to dispose of oily waste at the Prudhoe Bay Unit Pad 3 Oily Waste Injection Facility.

At the time of the site visit, the spillage had been removed, although there were signs of some stained tundra outside the repaired reserve pit. According to information submitted to EPA by Standard following the EPA contractor site visit (Standard 1988): "On July 24, 1987, SAPC reported a spill of 40 to 50 gallons of crude oil and diesel from a leak in the north wall of the northeast reserve pit at J Pad, and on July 26, SAPC reported a spill of 5 to 10 gallons of diesel/crude from the dike wall of the west pit. Both spills were cleaned up, and impermeable embankment liners have been installed." (This site is documented in photos 122 and 123).

Site # 9 Standard's Endicott Production Facility

Endicott is an oil and gas drilling and production facility built on a gravel causeway that extends approximately 5 miles from shore into the Arctic Ocean. According to a previously mentioned ADEC report on generation and disposal of liquid wastes (ADEC

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1988v): "Greater than 25 drilling operations have occurred in the nearshore areas of the Beaufort Sea. the SAPC [Standard] Endicott project is the only production facility to date and when completed will have approximately 120 producing wells. As with onshore facilities, offshore drilling produces large quantities of liquid and solid wastes. Where wastes meet EPA discharge criteria, offshore disposal is permitted via an EPA NPDES permit. Discharged wastes include: water based muds, cuttings, completion fluids, workover fluids, drill rig washwater, sewage treatment plant effluent, desalination plant effluent and fire control system test water. The Endicott project discharged 3,506,000 gallons of muds and cuttings during 1987."

At the time of the site visit, drilling was being performed on a section of the Endicott facility. Drilling muds, cuttings, and fluids are discharged directly into the Arctic Ocean via the permitted NPDES outfall. The area is a feeding ground for arctic aquatic life in the summer.

The Endicott gravel mine is located onshore near the Endicott facility. Millions of cubic yards of gravel have been removed from this site. According to Carl Hemming with the Alaska Department of Fish and Game, the permit for the Endicott mine site includes some specific requirements for rehabilitation. The requirements state that eventually, overburden recovered from the site is to be placed on one or two sides of the pit, allowing for the berms on the opposite sides to be pushed back down when the pit is no longer used as a source of gravel. It is hoped that eventually this will allow for reclamation of the site as a freshwater fish habitat. At the time of the site visit, the pit was still being used as a source of gravel. (The Endicott facility and gravel mine are documented in photos 130 and 135-142.)

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SITE DESCRIPTIONS - NORTH SLOPE BOROUGH FACILITIES

Site # 1 Oxbow Landfill

The Oxbow landfill, operated by the North Slope Borough, is the primary offsite disposal site for municipal solid waste, incinerator ash and industrial waste that is not recycled or injected on the North Slope. The landfill is located on a portion of an abandoned gravel mine site. The landfill has two unlined pits, one very large unlined pit for industrial waste and domestic garbage (the original gravel mine site) and one smaller unlined pit designated for oily waste.

The oily waste pit was opened in May of 1980 and the permit for the pit was reissued by ADEC on March 3, 1987 (Permit No. 8636-BA023). The oily waste pit was designed to receive loads of 10,000 cubic yards of waste annually. As of September 1988, the oily waste pit had received 102,490 cubic yards of waste since January 1, 1988. A large portion of this waste, 72,000 cubic yards, consisted of drilling waste that was brought to the oily waste pit over a six week period in May and June of 1988. After the past year of operation, the oily waste pit is nearing capacity. According to a letter from the North Slope Borough (North Slope Borough 1988) to ADEC dated October 10, 1988, the following quantities of materials were delivered to the Oxbow landfill during 1988:

Month	Metal	Solid Oily Waste	Total
Jan. 88	1,388	1,490	2,878
Feb. 88	1,656	825	2,481
Mar. 88	2,570	754	3,324
Apr. 88	2,203	8,672	10,875
May 88	2,140	69,599	71,739
Jun. 88	1,589	844	2,433
Jul. 88	6,067	5,781	11,848
Aug. 88	4,444	6,374	10,818
Sep. 88	3,606	8,151	11,757

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TOTAL	25,663	102,490	128,153 cubic yards

As mentioned, the oily waste pit is constructed from gravel and is not provided with a liner. Thermistors are placed around the perimeter of the pit to monitor temperatures. No information is available on the frequency or results of readings from the thermistors. Permafrost serves as the only barrier to prevent migration of waste materials from the pit. No other techniques are employed to monitor for possible waste migration. A sump, which is a low lying area within the oily waste pit, has been created to collect free oil and storm water contained in the waste pit. Based on available information, it is not possible to determine how the oily stormwater from the oily waste pit is currently disposed.

ADEC has not established formal criteria for storm water management at the landfill; however, ADEC has issued general permits in the past for discharge to the tundra of stormwater from the landfill. Through tundra flow this discharge has entered the Put River, which is directly adjacent to the landfill. According to the last report on the dewatering of the Oxbow landfill, in 1985 supernatant from the oily waste pit and from the solid waste pit was pumped onto the tundra under permit from ADEC (North Slope Borough 1985). According to the report: "...approximately 9-10 million gallons were pumped from the oily waste pit between May 30, and June 29, 1985." As required by permit, the effluent was sampled for total benzene, toluene, ethylbenzene, para-xylene, meta-xylene, and ortho-xylene; oil and grease; chemical oxygen demand; manganese, settleable solids; and dissolved oxygen. Quantities of total benzenes, toluenes, and xylenes detected in the effluent ranged from 0.004 ppm to 0.360 ppm; quantities of oil and grease detected in the effluent ranged from 1.4 mg/l to 10.8 mg/l; chemical oxygen demand in the effluent ranged from 105 mg/l to 219 mg/l; quantities of manganese in the effluent ranged 0.16 mg/l to 0.44 mg/l; a trace of settleable solids were detected; and dissolved oxygen in the effluent ranged from 1.6 mg/l to 13.2 mg/l. According to the dewatering report, between July 27, and August 17, 1985, approximately 13.7 million gallons of supernatant were discharged from the solid waste pit under permit from ADEC. Arsenic levels in the effluent ranged from .007 mg/l to .032 mg/l; barium levels ranged from .01 mg/l to .3 mg/l; cadmium levels ranged from .005 mg/l to .009 mg/l; lead levels ranged from .015 mg/l to .084 mg/l; and oil and grease levels ranged from 1.1 mg/l to 5.4 mg/l.

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According to the dewatering report: "Pumping of the solid waste pit for the most part was very routine. On several occasions the screens on the suction hoses became plugged with floating material and decreased pump efficiency. The diesel pump was lost for several days due to a breakdown. On August 14 oil containment booms were placed around the suction hoses and oil absorbant pads were laid on the water surface to remove the oil sheen." The oily waste pit was dewatered again between September 9, and October 4, 1985. As stated by the report: "Total estimated volume discharged from September 9 through October 4 is 9 to 10 million gallons." Prior to the second discharge from the oily waste pit, a water sample was taken from the pit which indicated the presence of the following constituents: 225 mg/l chemical oxygen demand; 7.3 mg/l oil and grease; 0.031 mg/l arsenic; 1.0 mg/l barium; 0.006 mg/l cadmium; and 25 ppb to 164 ppb total volatile organic compounds.

This discharge to the tundra from the landfill has not occurred for two years. In 1988, the landfill operators initiated an aggressive snow removal program to remove as much snow as possible from the pit before it melted during breakup. As a result of this snow removal program, large mounds of snow containing gravel, debris, and potential contaminants from the pit were deposited in a designated area on the tundra. During the site visit, the ADEC indicated that it is likely that gravel contained in the snow removal material would bury and kill the tundra. A sump located inside the solid waste pit was created several years ago to collect snow melt. The operators are in the process of closing this sump by freezing the water in place.

According to ADEC, waste generators do not provide the landfill operators with a chemical analysis of oily waste prior to disposal in the oily waste pit, and additionally, no chemical analysis of the waste is performed by the landfill operators before or after accepting the waste. It should be noted that the Oxbow landfill is the only oily waste disposal site on the North Slope that is available to the service companies, and as previously mentioned, wastes generated by service companies are not exempt from federal regulation under RCRA Section 3001, and are therefore subject to full regulation under RCRA Subtitle C. Based on currently available information, it is not possible to determine if RCRA hazardous wastes are disposed of in this oily waste pit.

As stated by Standard (Standard 1988): "...the North Slope Borough does require that a manifest accompany each shipment and that the manifest certify that the waste mat...

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the Borough criteria for disposal in accordance with their permit. Additionally, the contents of the oily waste pit are analyzed regularly. All drums accepted by the landfill must be triple-rinsed and crushed." According to ADEC, the Department does not require that the contents of the Oxbow oily waste be analyzed regularly, nor is the Department aware of any regular analysis that is performed on the contents of the Oxbow oily waste pit. Further, ADEC does not require that drums accepted at the Oxbow be triple rinsed. According to ADEC, the criteria is that no visible residues remain on the walls or ends of the drum.

In the fall of 1988, the North Slope Borough submitted a permit application to the Army Corps of Engineers and ADEC for expansion of oily waste disposal capacity into a second oily waste pit in an adjacent portion of the former gravel mine site. The permit application provides for improvements over the design of the current oily waste pit such as installing a full liner in the bottom of the pit. However, because of inadequacies in the pit design, maintenance, and operation as described in the permit application, ADEC and the Army Corps of Engineers have not issued the new permit to the Borough.

In public comments submitted to EPA from the Trustees for Alaska on the Borough's application for expanding the oily waste capacity at the Oxbow, information is provided that raises issues concerning the performance and integrity of the second oily waste pit as proposed. EPA has not confirmed the facts alleged by the Trustees, and includes major points provided by the comments to indicate the nature and extent of the problems which may exist if this permit is issued as submitted. These comments were prepared by a former senior production engineer who worked for ARCO for a number of years on the North Slope, and many of the comments are based on actual experience at numerous other oil production facilities in operation on the North Slope. The comments are extensively referenced; references have been deleted from text quoted below.

One of the issues raised by these comments concerns the integrity of the permafrost in and around the proposed site for the second oily waste pit (Trustees 1988b): The Oxbow is named for the shape of the Putuligayuk River in this area, which is that of an oxbow. This shape is indicative of a meandering stream course and of excluded elbows of old stream courses. A number of these old stream courses can be seen in the Oxbow area by referring to the USGS Beechey Point B-3 Quadrangle. These old stream courses may have formed "taliks" beneath their streambeds which are thawed areas containing water.

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The USGS Quadrangle map clearly depicts at least two such areas immediately adjacent to the Oxbow pits, one to the south and one to the north. These areas may be thawed and may be in communication with the Putuligayuk River. The existence of thawed areas immediately adjacent to the proposed Oxbow SOWP #2 [Solid Oily Waste Pit #2] must be investigated prior to the issuance of a Solid Waste Permit....NSB's [North Slope Borough's] waste acceptance criteria does not preclude the acceptance of wastes contaminated by glycol, methanol, gasoline, diesel, or other light hydrocarbons which will act as freeze point depressants and may prevent the freezeback of the emplaced wastes. Light hydrocarbons interred into the SOWP may nullify the freezeback method of disposal....At this time there is no support for a design based on the existence of continuous permafrost."

Another issue raised by the comments involves the anchoring mechanism and integrity of the proposed liner: "The anchoring method suggested for the bottom liner in Detail A does not appear workable. The anchoring mechanism design appears to assume that the berm will remain perpetually frozen. This may not be the case on a long term basis, and certainly will not be the case on a short term basis. NSB has stated at numerous points in their application that the upper 5-6 feet of fill will thaw each year. The anchoring layers of gravel in the berm lie between 2 and 5 feet in depth....The gravel suggested for fill in Detail 3, above and below the liner appears likely to puncture the liner under pressure, either from the weight of the fill above the liner or from frost heaves below the liner. At least one foot of sand should be placed next to the liner on either side of it to protect it from the gravel, some of which will have sharp edges."

The comments go on to discuss the North Slope Borough's assertion that it will maintain a non-threatening water level in the adjacent area of the Put 23 pit. As stated by the comments: "NSB should be required to describe how this can be accomplished if any of the following occur:

a. Flooding of the Putuligayuk River. Ice jams upstream of the Put 23 pit have raised the river level as much as 22 feet according to USGS records...

d. A storm surge from the Beaufort Sea. A storm surge in 1970 flooded the Prudhoe Bay area to a distance of 3 miles inland. These events occur periodically, and a

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research of the available references reveal that a storm surge capable of covering the Oxbow SOWP #1, #2, and the Metals Pit appears to be statistically probable in the next ten years."

Another issue raised by the comments involves waterfowl and waterfowl habitat: "The area around the mouth of the Putuligayuk River provides critical habitat for a number of species including geese, loons, and brant. Runoff from the Oxbow area enters this area very quickly...Failure of the containment from the Oxbow pits would result in contamination of and perhaps loss of this habitat."

The comments go on to address the generation of leachate at the second proposed oily waste pit: "A considerable amount of leachate will be produced in this pit due to the saturated nature of many of the wastes processed. This will be especially true in the summer when the upper 5 to 10 feet of the wastes thaw and runoff occurs. Some of these fluids will collect in low points such as the sump depicted in attachment 5. However, it would be irrational to expect that all the fluids in a pit, comparable in size to 8 football fields, is going to cooperate and collect at a central point....NSB has not proposed any viable plan for the collection, transport, and disposal of these fluids....At a minimum, it appears that NSB should plan on handling 100,000 to 200,000 barrels per year of fluids from this pit."

The solid waste pit (or Metals Pit) at Oxbow is operated as a sanitary landfill. The landfill is currently filled to approximately half its total porential capacity. Like the oily waste pit, the solid waste pit is constructed from gravel and does not have a liner. Thermistors are placed around the perimeter of the pit to monitor temperature. Permafrost serves as the only barrier to prevent the release of contaminants. No other techniques are employed to monitor for possible waste migration. Incoming wastes are not characterized by the landfill operators. According to State officials, the landfill has served, and continues to serve, as the disposal site for most of the wastes that are not recycled or injected generated by North Slope oil field operations. The wastes disposed of at the landfill include airplanes, vehicles, used machinery, crushed drums, building materials, insulation, tires, incinerator ash, domestic garbage, and a variety of industrial wastes. According to ADEC, waste lumber is routinely burned on site. This burning onsite constitutes a violation of EPA's solid waste disposal regulations at 40 CFR 257.3-7 (a).

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On the day of the site visit, a significant volume of industrial waste and municipal solid waste was exposed. Seagulls were feeding on large piles of what appeared to be incinerator ash.[13] According to ADEC, the North Slope Borough has improved its housekeeping at the landfill over the last two years in response to enforcement oversight by ADEC. (Refer to photos 87-98.)

Site # 2 - North Slope Borough Municipal Incinerator - Deadhorse

The North Slope Borough operates an incinerator in Deadhorse. The incinerator primarily accepts domestic garbage; however, some industrial waste is accepted. For example, according to Standard personnel, all used filters generated in the large gathering centers and flow stations are sent to the North Slope Borough incinerator. These include glycol heat transfer filters, sock type filters, and charcoal filters.

According to ADEC, the incinerator's combustion chamber operates between 1000° F to 1200° F in the winter and around 1500° F in the summer. The ADEC permit under which this facility operates requires an operating temperature of 1500° F. ADEC states that the operators of this facility are working on ways to increase winter operating temperatures. High operating temperatures are required for burn efficiency and destruction of principle organic hazardous constituents (POHCs) and other toxic compounds. According to ADEC, the facility was fitted with an electrostatic precipitator to remove particulates in the spring of 1988. As mentioned earlier, ash generated at this facility is disposed at the Oxbow landfill. This facility was not toured during the North Slope visit. (Refer to photo 99.)

SITE DESCRIPTIONS - SERVICE COMPANIES, DEADHORSE

[13] Incinerator ash from the North Slope incinerator is disposed of at the Oxbow landfill. The North Slope incinerator, located in Deadhorse, accepts both industrial waste and domestic garbage.

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Site # 1 Frahley Service Company - Deadhorse

The Frahley service company provided North Slope operators with a variety of support services.[14] The Frahley site in Deadhorse is now abandoned, and there are no current operations at the site. The site consists of several dilapidated structures located on a gravel pad. At the time of the site visit, hundreds of used vehicle-type batteries were disposed or abandoned on site. In some cases, the batteries were strewn about the ground or were found inside the structures. The condition of the batteries varied; some were intact while others were cracked, allowing battery acid to escape.

Between twenty and thirty 55-gallon drums were abandoned on site. Some of the drums appeared to be empty, while others were partially full. The contents are unknown. Because of the physical condition of some of the drums, spillage is inevitable. No secondary containment was present on this pad for preventing migration of spilled material.

The predominant structure on site is a steel building with a gravel floor. At the time of the site visit, the floor of this building was heavily saturated with oil and appeared black in color. Gasoline and diesel vapors inside the building were noticeable. (At the time of the site visit, the building was closed on all sides.) In addition to debris, half-empty, unlabeled drums, used machine parts, tools, and various other containers were present inside the building.

The gravel pad surrounding the steel building showed evidence of numerous spills. The spillage was dark in color and had a predominant hydrocarbon odor. Some of the spillage appeared to have flowed into the adjacent tundra. Trash and debris were present in the tundra at the time of the site visit.

During the site visit, ADEC personnel indicated that at one time the tundra area directly adjacent to the Frahley pad received effluent from the sewage treatment plant at the Prudhoe Bay Hotel. According to an ADEC letter to the operator of the Prudhoe Bay Hotel dated June 15, 1984 (ADEC 1984c): "The current discharge location causes flooding within the Airport Lease Tracts. This ponded sewage effluent is considered a health hazard

[14] Frahley is a subsidiary of Massey-Ferguson.

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to the workers and inhabitants of the area. It is expected that at the end of a one year period, an alternative disposal site will be found that will remove the effluent from populated areas." The treated sewage effluent discharge point was moved further out onto the tundra. Large algae mats are still visible from the effluent discharges, and as documented by photographs, much of the vegetation in the area is dead.

On July 6, 1988, ADEC issued Frahley a Notice of Violation (ADEC 1988e; ADEC 1988f). According to the accompanying letter: "On June 15, 1988, while inspecting the Deadhorse service area I observed a number of problems on the Frahley pad. The problems included spills in the shed on the pad and used batteries stored on the back of the pad. Some of the batteries have been broken open. In addition, there are open barrels that contain liquids including waste oil. None of these spills have been reported to this department within the prescribed time period allowed by state regulations." The letter goes on to state: "The violation notice requests that a spill report be submitted for each spill, waste batteries be removed and properly disposed of and a plan for final cleanup be submitted to the department for approval prior to implementation."

On September 6, 1988, ADEC received a letter from the attorney of the current owner of the Frahley pad (Kellicut and Jones 1988). According to this letter, the current owner, Mr. Jerry Johansen, re-acquired title to the property following a foreclosure sale on the property. The letter goes on to state: "In any event after such re-acquisition of the subject property, Mr. Johansen has not utilized the property whatsoever. It is our belief that any alleged discharge of hazardous substances occurred during the time of occupancy by Walter Ratterman and/or Deadhorse Properties." According to ADEC, after initial contact was made with Mr. Johansen's attorney over the telephone, Mr. Johansen's attorney has not returned subsequent ADEC calls. ADEC is holding Mr. Johansen responsible for cleanup of the site.

According to ADEC, as of October 21, 1988, the batteries located on site had been moved to one corner, and the batteries were being covered with snow removed from the other areas of the pad. No cleanup had begun in the shed, and the drums had not been removed. Some time between October 21 and October 30, the batteries located on site were removed by an unknown party. (Refer to photos 48-54.)

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Site # 2 Deadhorse Hotel Lease Tract - Deadhorse

The Deadhorse Hotel lease tract has historically been the site for staging support services for Prudhoe Bay oil and gas operators. The hotel is currently abandoned, and a variety of wastes generated by oil field support services have been abandoned on site, including dozens of empty and partially full 55-gallon drums, unused chemicals, used batteries, abandoned tanks and vessels, steel parts, and general debris. Some of the partially full, unlabeled drums contain what appears to be lube oil, arctic pack, and unidentified substances. The condition of these drums was fairly poor, and leakage was evident from a few drums.

Large piles of garbage were stacked on site. The garbage contained a variety of waste including domestic garbage, painting wastes, used vehicle batteries, and engine oil filters. An onsite incinerator appeared to have been used to incinerate industrial waste and domestic garbage. Large piles of incinerator ash were evident near the incinerator. The State does not require a permit for an incinerator of this size. Storm water runoff from the ash piles drains uncontrolled to the surrounding tundra.

The site was previously used as a diesel fueling station for vehicles. Two diesel fuel tanks, each with an estimated capacity of 10,000 gallons, were used at one time and are abandoned on site. Diesel spills and odors were evident near these tanks; in some areas diesel fuel was floating in pools on the gravel pad. Because secondary containment is not provided, the spilled diesel fuel has the potential to migrate off the pad into the surrounding tundra. According to ADEC, there have been instances where spillage washed across the road serving this facility and entered the adjacent lake. The adjacent lake serves as a source of drinking water for Deadhorse.

As documented by photographs, storm water runoff from one side of the pad carried a thick, unidentified white substance from the pad to the tundra. Fuel spills and other unidentified substances have completely saturated the gravel pad in this area. An attempt had been made by service companies operating on the pad to clean up the spill with absorbent materials, but this attempt appeared to be severely inadequate. One piece of absorbent material measuring approximately three square feet was placed on the spill area. The spill area measured several hundred square feet.

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On July 6, 1988, ADEC issued Great Northern Services (operators of the Deadhorse Hotel lease tract) a Notice of Violation for the numerous spills observed on June 17, 1988 (ADEC 1988g; ADEC 1988h). According to the letter accompanying the Notice of Violation: "On June 17, 1988, while inspecting the Deadhorse service area, I observed numerous spills on the Deadhorse Hotel pad. The spills included hydrocarbons, calcium chloride, ammonium chloride and broken batteries. These spills have not been reported to the department within the prescribed time period allowed by state regulations." The letter goes on to state: "The spills are located at various locations throughout the pad. The violation notice requests that a spill report be submitted for each spill, the immediate cleanup of gross spillage and the submittal of a plan, for final cleanup, to the department for approval before being implemented."

On September 26, 1988, ADEC received a letter from Alaska Technical Services, Inc., representing the Deadhorse Hotel (Alaska Technical Services 1988). According to the letter, the following plan was submitted to clean up and or remove any contaminants at this location:

"The area directly behind the main hotel building and adjacent to the fuel storage area shall be excavated and removed to the borough landfill. Testing to ensure compliance will be done at this time prior to hauling any additional landfill. The building now serving as Arctic Coil Tubing Co. shop will have the surface contaminants removed and additional testing shall be done under the existing wooden flooring. Samples of the gravel shall be tested in a wide grid pattern on the remaining pad with emphasis on the area between Arctic Coil Tubing shop and the rear of the pad as discussed at our meeting."

According to ADEC, the cleanup of the Deadhorse Hotel pad has proceeded; however, the cleanup plan was never approved by the Department. In September, officials with ADEC met with the cleanup contractor at the Deadhorse Hotel site and discussed cleanup plans. In October of 1988, the Department received a copy of a report written by Alaska Technical Services for the operator of the Deadhorse Hotel, discussing remedial work performed at the Deadhorse Hotel (Alaska Technical Services 1988a). The report states: "Enclosed is the synopsis of the work performed for you by our firm during the first week of October of this year at the Deadhorse Hotel Pad. After discussion with representatives of the Alaska Department of Environmental Conservation three main areas on the pad with hydrocarbon contamination were addressed. As of this time two of the

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three areas have been cleared of the contaminated gravel [disposed at the Oxbow oily waste pit] and brought to compliance guidelines suggested by the Fairbanks office of the ADEC." (Refer to photos 55-67.)

Site # 3 Aurora North Fuel - Deadhorse

Aurora North Fuel oil field service company has an abandoned facility in Deadhorse. This facility contains dozens of used drums, machinery parts, and general debris. Leakage was evident from a few of these drums that were in poor condition. The drums were placed directly on the gravel pad without secondary containment, providing the potential for drum contents to migrate onto the nearby tundra. Some of the drums contained unidentified substances. Others had labels indicating that hydraulic fluid, motor oils, and diesel fuels were present. Some absorbent materials were placed around the leaking drums in an attempt to contain the spillage. There were numerous fuel spills over the gravel pad.

As previously mentioned, wastes generated at this site are subject to full regulation under RCRA Subtitle C to the extent that they exhibit RCRA hazardous characteristics. According to ADEC, the department has been unable to respond and follow up on this site because of lack of manpower. (Refer to photos 68-71.)

Site # 4 B. J. Titan Oil Field Services - Deadhorse

B. J. Titan operates an oil field services facility in Deadhorse. Dozens of used drums were stacked in random fashion on site. Most drums were placed directly on the gravel pad, without secondary containment. Many of the drums were in poor condition, exhibiting signs of damage, rust, and corrosion. While many of the drums contained unidentified liquids, some had labels indicating that corrosive liquids were present. The lack of secondary containment allows for potential migration of contaminants off site and onto adjacent tundra. The site contained a large number of crushed drums. The disposal method for the drum residue prior to crushing is unknown.

B. J. Titan maintains acid tanks and an acid washout area adjacent to the tanks. As documented by photographs, the acid tanks lacked adequate secondary containment. At the

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time of the site visit, the cement berm around the acid tanks was crumbling and was entirely absent in places. Acid spills in this area were evident from the discolored gravel. The acid washout area was not provided with secondary containment and could potentially allow the migration of contaminants off site onto the tundra. There was evidence of what appeared to be wet and dry cement spillage onto the tundra from the pad. The tundra in this area was dead. As documented by photographs, at the time of the site visit, large, dark oily stains and an unidentified white substance were present on the pad.

According to ADEC, B. J. Titan has constructed secondary containment structures for drum storage. However, ADEC also states that State law does not require secondary containment for drum storage. Any such containment is voluntary. As previously mentioned, wastes generated at this site are not exempt from hazardous waste regulation under RCRA Section 3001, and are subject to full regulation under RCRA Subtitle C to the extent that they exhibit RCRA hazardous characteristics. (Refer to photos 72-77.)

Site # 5 Forward Alaska Service Company - Deadhorse

Forward Alaska oil field service company abandoned a site in Deadhorse located directly adjacent to the North Slope Borough water impoundment which is the primary source of drinking water for most service companies located in Deadhorse. A wooden platform, used to store a variety of used drums, batteries, and general debris, was supported on pilings a few feet above the pad. The gravel pad around this structure was stained with spillage. Damaged drums were abandoned in a horizontal position, thus providing the potential for any contents to escape onto the gravel pad. Most of the drums were in very poor condition, exhibiting signs of damage and corrosion. Several of the drums displayed methylene chloride labels. There was no secondary containment around this storage area.

As previously noted, this site is directly adjacent to the water impoundment from which the North Slope Borough draws much of its water for domestic use in the Prudhoe area. On the day of the site visit, runoff from under the wooden storage structure was flowing into this impoundment. Such episodes of runoff pose the potential for contaminants to migrate into the lake. Signs of erosion from the site into the lake were evident around the storage area.

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An onsite building was once used for staging oil field service activities and storing oil field chemicals. The floor of this structure was saturated with oil. Partially empty drums containing a variety of oil field chemicals, including drums labeled as containing isocyanate compounds, were present in this structure. Some of the drums were in poor condition.

On one side of the facility, a large number of used drums were stored directly on the gravel pad. At the time of the site visit, the water level was near these drums because of breakup. There is no secondary containment around these drums, thus providing the potential for migration of contaminants from these drums onto the tundra and into the adjacent water impoundment.

Since the time of the EPA contractor site visit, ADEC states that the 'Alliance', a group of Deadhorse service company operators, gathered all used drums at this site and placed them in a lined area inside one of the structures on site. The Alaska Department of Natural Resources, the lease manager on the Forward Alaska Pad, is in the process of revoking the lease for this property. According to ADEC, once the lease is revoked, ADEC will sample the site and provide the funding for cleanup.(Refer to photos 78-81.)

Site # 6 North Slope Salvage Site - Deadhorse

North Slope Salvage Inc. (NSSI), a facility that accepted used oil field drums, was responsible for an uncontrolled release of contaminants to the tundra during breakup in 1983. NSSI ceased operations following this incident, most of the structures were removed, and currently there are no activities on the pad. Upon referral from ADEC, the State Attorney General's office was successful in obtaining in court a total of nine felony counts and a fine against the operators responsible for this incident. The operators, Bill R. Hobson Sr. and Bill R. Hobson Jr. were convicted on seven of the nine counts including willful discharge of oil, willful failure to notify ADEC of an oil discharge, willful failure to clean up an oil discharge, willful failure to obtain ADEC's approval before the disposal of a hazardous substance, willful failure to notify ADEC of a hazardous substance discharge, willful failure to clean up a hazardous substance discharge, and willful unlawful disposal of solid or liquid waste without a permit. Mr. Hobson senior received a total of 60 days in jail and Mr. Hobson Jr. received a total of 30 days in jail; however, the jail terms were suspended in lieu of community service. Mr. Hobson Sr. was fined a total of $2500 and

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Mr. Hobson Jr. was fined a total of $1250. Mr. Hobson Sr. was put on five years probation; Mr. Hobson Jr. was put on three years probation. The specific condition of their probations was that neither engage in the salvage or disposal business involving drums, waste liquid oils, or hazardous substances (ADEC 1984d).

According to ADEC, approximately 14,000 used and partially full 55-gallon drums of oil field chemicals were stored on site without secondary containment. Many of these drums leaked for a period of up to six months before being discovered. ADEC discovered the spillage in the spring of 1983, and upon discovery of the leaking drums, required that a protective berm be placed around the pad. At that time Federal enforcement was requested by the State to aid in encouraging the operator to clean up the site; however, the State took the lead in enforcement, and cleanup was conducted.

According to ADEC, after an inadequate cleanup effort was mounted by NSSI, ARCO and Standard volunteered to finance additional site remediation as they were the primary contributors of the drums at the site. The liquids, primarily mixtures of solvents, oils, fuels, and corrosion inhibitors, were collected by vacuum tank trucks and were either sold as boiler fuel or injected at the Pad 3 injection facility. Most liquids recovered were used as boiler fuel in Deadhorse facilities. According to ADEC, most liquids recovered at the site exhibited the RCRA hazardous characteristic of ignitability. Extensive sample results for recovered liquids are on file with ADEC (ADEC 1983). A natural gas flare was used to incinerate the residues in the approximately 14,000 drums, and the drums were disposed at the Sand Dunes landfill. The Sand Dunes landfill is now closed.

In August of 1983, ADEC sampled the NSSI gravel pad and standing water northwest of the site to check for contamination in the gravel pad and to check for off-site contamination. According to analytical data on file in the ADEC office in Fairbanks dated November 2, 1983, low levels of organics were detected in the gravel and water samples taken (ADEC 1983). Organics detected included: benzene at 20 ppb, xylene at 67 ppb, methyl naphthalene at .02 ppb, carbolic acid ester at .03 ppb, traces of naphthalene, various saturated hydrocarbons, unsaturated hydrocarbons, phenol, and 5-methyl-4-phenyl-2-oxazolidinone, methylphenol at 2.4 ppb, benzeneacetic acid at 9.1 ppb and 18.0 ppb, heptanoic acid at 2.4 ppb, and 2-ethylbutanoic acid at 3.8 ppb.

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According to Standard (Standard 1988): "Following completion of the cleanup, ADEC personnel also visited the site several times and observed only very light sheens on the water between the gravel pad and the containment dike that had been built around the pad (Mach 1987.) ADEC has conducted no other sampling program at the site." NSSI has not re-established operations in Deadhorse since this incident. (Refer to photos 82-85.)

Site # 7 Child's Pad - Deadhorse

Prior to 1987, Child's Pad was occupied by a Deadhorse service company. In the spring of 1987, ADEC discovered that a large number of oil field drums were inappropriately stored on Child's Pad in Deadhorse. Most of the structures were removed following this incident, and currently there are several subleasees active on the pad, including the operator of a store and the operator of a mechanic's shop. The owner of the lease is bankrupt.

According to ADEC officials, drums were leaking used oil and oil field chemicals onto the tundra. Additionally, solid wastes including domestic garbage, used batteries, and painting waste were discovered on site.

ARCO and Standard volunteered to pay for cleanup of the site. According to information submitted by Standard to EPA following the EPA contractor visit (Standard 1988): "ARCO and SAPC made an agreement with the State to remove the solid waste to the North Slope Borough Landfill, collect any abandoned drummed material in a lined containment area, and sample the gravel pad to determine the extent of any contamination."

During cleanup, the solid wastes were segregated and prepared for disposal. Chemical analysis was performed on all drummed material by AM Test Inc. and Rocky Mountain Analytical in August and September, 1987. Initial analysis on some drums, dated September 30, 1987, included tests for total organic halogens, corrosivity, flash point, reactivity and metals. These results indicated that flash point ranged from above 212° F to less than 60° F, pH ranged from 7.3 to 9.0, reactivity was negative on all samples, Total Organic Halogens ranged from less than 50 ppm to 25,100 ppm, and while most metals were absent or detected on only trace quantities, the samples were found to contain as much as 46 ppm lead.

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According to a letter accompanying additional test results submitted to ARCO by AM Test Inc. dated February 24, 1988, samples of drummed material were analyzed by AM Test for trichloroethane only (little or no detectable amounts of this substance were found). In subsequent analysis, it was determined that several other organic pollutants were present in the samples (AM Test 1988). However, as the letter accompanying the test results states: "The concentrations of the individual compounds are significantly lower than the Total Chloride values that were reported earlier. However, given the volatility of these compounds, the integrity of the samples, and the length of time between analyses, I am not surprised." Constituents found in the samples include: chlorobenzene at 970 ppm and 321 ppm; 1,2 dichlorethene at 11 ppm, and 1 ppm; freon at 17,300 ppm, 55 ppm, 12,800 ppm, 270 ppm, 15,000 ppm, 18,700 ppm, and 143 ppm; chloroform at 5.3 ppm, and 2.9 ppm; carbon tetrachloride at 4.8 ppm, and 5.2 ppm; and 1,1,1-trichloroethane at 1 ppm and 1.5 ppm.

According to a letter from ARCO to ADEC and EPA dated January 13, 1988, a total of 428 drums of waste were recovered during the cleanup of Child's Pad; the contents of 279 drums were to be recycled by ARCO, the contents of 100 drums were to be disposed at the Pad 3 Oily Waste disposal facility, and 49 drums were to be disposed of as hazardous waste (ARCO 1988e). As the letter states: "The 49 drums of liquid material labeled as hazardous waste in the attachments will be left on-site in the lined diked area on the Child's Pad pending further action by ADEC." To date, the 49 drums of hazardous waste are held in the lined containment area on the pad awaiting final disposal arrangements. According to Standard: "A plan to recycle the waste oil that meets the used spec fuel criteria and for handling the hazardous waste disposal of the drummed waste is currently being developed for the State."

In August of 1988, ARCO sampled the gravel in Child's Pad by boring three holes into the gravel pad and taking samples at the base of the pad, and taking samples at three surface locations on the pad. The samples were analyzed for total organic halides; purgeables, and halogenated volatile organics including freon; and EP Toxicity. Sample results showed 1.5 mg/kg barium in one sample; lead levels in four samples ranged from .37 mg/kg to .91 mg/kg; total organic halide levels in four samples ranged from .10 ug/g to .46 ug/g; dichlorodifluoromethane was found in one sample at 25 ug/kg; freon was found in one sample at 28 ug/kg; 1,1-dichloroethylene was found in one sample at 26 ug/kg;

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methylene chloride was found in two samples at 35 and 12.6 ug/kg; chloroform was found in two samples at 26 and 270 ug/kg; and tetrachloroethylene was found in one sample at 14.1 ug/kg. EP Toxicity analysis on the gravel showed lead in samples at .73 mg/l, .37 mg/l, and .91 mg/l (the RCRA maximum allowable concentration for lead in an EP Toxicity test is 5 mg/l). Barium was found in one EP Toxicity sample at 1.5 mg/l (the RCRA maximum allowable concentration for barium in an EP Toxicity test is 100 mg/l), (Harding Lawson 1988).

According to the letter accompanying the Child's Pad sample results from ARCO to ADEC (ARCO 1988h): "Enclosed is a copy of the analytical results from gravel samples taken from Child's Pad this August. It appears that the gravel may be handled as a non-hazardous waste. We would like to confirm this with EPA. When this is confirmed, ARCO will begin preparation of a plan to dispose of the gravel for review by your department. The most likely scenario would involve removal the end of summer 1989 to take advantage of thawed conditions on the pad, and we hope the North Slope Borough Landfill will have a permit and location by that time to receive the wastes." (Refer to photo 86.)

Site # 8 Dowell-Schlumberger - Deadhorse

Dowell-Schlumberger (DS), a large, worldwide oil field service company, has a facility in Deadhorse. DS maintains its own pad and an adjacent storage pad for storage of equipment. DS provides downhole completion and workover services and sells various acids, completion chemicals, solvents, and dry materials such as cement to the oil and gas production companies on the North Slope.

On the day of the site visit, ADEC discovered a large spill area, the result of which was approximately two acres of dead tundra.[15] The source of this spill was from the storage pad. According to ADEC, if a tundra area receiving a spill remains saturated, there will be little or no revegetation. If the spill area is flushed out soon after a spill, then

[15] At the time of the site visit, ADEC personnel on site were unaware of a spill report submitted to ADEC on January 5, 1988, in which 150 to 200 gallons of acid were reported as spilled.

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revegetation of the tundra may occur. At the time of the site visit, the tundra was blackened where the spill had taken place.

On the pad itself, it was estimated by ADEC and the EPA contractor that hundreds of gallons of unidentified materials had been spilled. (This is documented in photographs.) A large pile of primarily chalky white material which also contained some dark, oily material, was stacked up on one edge of the pad. The pile of material was not provided with any measure of containment, and the gravel around the pile was stained with rust-colored chemicals. Various other spills and stains were observed around the equipment storage area used by DS.

On the DS operations pad, approximately 50 leaking drums were found in one corner. The unidentified substance leaking from the drums appeared milky white and gave off a very strong chemical odor. Significant amounts of an unidentified thick, white liquid substance were observed flowing off the pad into the tundra. This material also gave off a strong chemical odor. According to State officials, the area of tundra behind this pad (it is surrounded by various other service companies) has been especially impacted by spills and bad housekeeping. Based on calibrated aerial photographs of the area, ADEC estimates that this area contains 60 acres of dead, contaminated tundra. Erosion from runoff was observed on the edge of the DS pad immediately adjacent to the leaking drums.

On another corner of the DS pad, more large-size spills were observed around a materials staging area. One spill was composed of a dry, chalky substance, while another appeared as a white milky substance. Yet another spill area contained a frothy, milky substance with small capsule-bubbles that appeared red, orange, and green in color. According to information received by ADEC subsequent to the site visit, this particular substance may have been an emulsion breaker. All of these materials had flowed onto the nearby tundra.

On July 6, 1988, ADEC issued a Notice of Violation to Dowell Schlumberger, Inc. for the numerous spills on the Dowell Schlumberger pads (ADEC 1988i; ADEC 1988j). According to the letter accompanying the Notice of Violation: "On June 17, 1988, while inspecting the Deadhorse service area, I observed numerous spills on the Dowell Schlumberger pads. These spills have not been reported to the department within the prescribed time period allowed by state regulations." The letter goes on to state: "The

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spills cited include dry chemicals under the storage tank on the eastern edge of the main pad, spills from drum storage in the southwest corner of the main pad, a dry chemical spill next to the drum storage, a dry chemical [spill] on the eastern edge of the storage pad and a liquid that surrounds the storage pad. There is evidence of many other spills throughout both of these pads."

The Notice of Violation requested a spill report be submitted for each spill, immediate cleanup of gross spillage and the submittal of a plan for final cleanup to the Department for approval before being implemented. On July 20, 1988, ADEC received a letter from Dowell Schlumberger outlining their plan for cleanup of the spills documented in the Notice of Violation, and cleanup activities that had already occurred. The letter does not identify the spilled material, does not discuss volumes released, and does not discuss sampling or characterization of wastes prior to disposal.

On October 7, 1988, ADEC received some of the spill reports requested in the July 6, 1988 Notice of Violation. Spills are described as 100 to 200 gallons of wash water from cement batch mixer, 3000 pounds of propping agent, 20 gallons of hydraulic oil, 4 cubic yards of bentonite clay, unspecified amount of class "G" cement, numerous small amounts of unidentified chemicals, and 20 gallons of diesel (Dowell-Schlumberger 1988a). According to the spill reports received by ADEC on October 7, the spills occurred in January, February, June and July of 1988. Some of the spills observed during the ADEC inspection of June 17 were not identified in any of the spill reports submitted by DS in October.

As previously mentioned, wastes generated by this service company are not exempt from any portion of RCRA and are subject to full regulation under RCRA Subtitle C to the extent that they are RCRA hazardous. (Refer to photos 105-120.)

<u>Site # 9 N.L. Baroid - Deadhorse</u>

The N.L. Baroid service company utilizes good environmental management practices on its pad, when compared to other service companies. N.L. Baroid supplies drilling muds, cement, and a variety of dry bulk chemicals. Some liquids in 55-gallon drums are also stored on this pad. All materials were neatly stored and stacked in boxed columns. However, the material was stored on the edge of the pad instead of in the middle

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of the pad. ADEC prefers storage of all chemicals in the middle of pads where spills can be more efficiently contained and prevented from flowing onto the tundra. Most of the drums and bags appeared to be in good shape, and very few were found to be leaking. Spillage on the pad was noticeably absent, especially compared to the other service company pads. Some spillage was evident around a diesel fuel storage tank; however, a gravel berm lined with plastic appeared to contain most of the spillage. (No photos were taken of this facility.)

Site # 10 Halliburton Service Company - Deadhorse

Halliburton is a major service company on the North Slope providing workover and completion services for North Slope operators. Halliburton uses acids, fracturing fluids, and other drilling, stimulation, and completion fluids in providing these services. A former sewage lagoon is located adjacent to the Halliburton pad. According to an ADEC letter and Notice of Violation dated July 30, 1987 (ADEC 1987f): "Enclosed is a Notice of Violation for the discharging of spent acid off the back of Halliburton's Lease Tract in Deadhorse, Alaska. The violation was observed on July 9, 1987. On that day a pumper truck released industrial wastewater to the lands and/or waters of the state. The driver of the truck stated the contents was spent acid that had been neutralized. No permit has ever been issued by the Department to Halliburton for this type of discharge."

In a letter responding to the Notice of Violation dated August 12, 1987, Halliburton states (Halliburton 1987): "Upon investigating this matter, I find that we did apparently discharge some fluid without a permit. This was done without my knowledge or approval, and the Deadhorse employees have been specifically instructed that no further discharges of this sort are to be made. The wastewater was generated in the following fashion: On July 8, 1987, a stimulation treatment was performed for Standard Alaska Production Company where 12% Hydrochloric acid and a mixture of 12% Hydrochloric/3% Hydrofluoric Acid was injected into Well Number 17 on E Pad. A small volume (approximately 50 gallons) remained in the acid tanker at the completion of the treatment, and was returned to our facility in Deadhorse. The leftover acid was neutralized in the transport using approximately 2,000 gallons of fresh water containing soda ash. This 2,000 gallons was the volume of fluid that was discharged."

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The letter goes on to state that leftover acid is routinely returned to the Halliburton facility and that after neutralization the acid is held in a 220 barrel holding tank. From the holding tank, the acid is transported to the Pad 3 injection facility.

An ADEC letter to Halliburton dated March 7, 1988 states (ADEC 1988r): "On July 8, 1987, the unpermitted discharge of wastewater from an acid truck to Halliburton Service's pad on A.D.L. Lease 47660, near Deadhorse, Alaska, resulted in the department issuing Halliburton a formal Notice of Violation. Subsequent investigation revealed evidence of pad contamination on other areas of the lease pad and adjacent wetlands. During phone conversations and meetings between you and department staff, it was agreed that Halliburton would conduct an environmental audit, pad assessment, and implement remedial actions necessary to properly address the department's concern for pad contamination."

The ADEC letter goes on to request a list of specific tasks to be performed in fulfillment of the environmental audit and subsequent remedial effort. In a letter from Halliburton to ADEC dated April 6, 1988, the company committed in writing to "perform all necessary remedial action regarding any discharges at our Deadhorse, Alaska leased facility", and a schedule was submitted for ADEC consideration (Halliburton 1988). In a letter from ADEC to Halliburton dated April 14, 1988, the Department states its concurrence with Halliburton's proposed schedule for remedial actions (ADEC 1988s). On April 25, 1988, Halliburton submitted to ADEC an extensive scope for the environmental audit to be performed on the facility (Halliburton 1988a). According to later correspondence, Halliburton nominated a private contractor to perform the environmental audit on the lease, and ADEC concurred with the choice for contractor (ADEC 1988t, Halliburton 1988b)

According to a letter from ADEC dated August 3, 1988 (ADEC 1988u): "In correspondence dated April 6, 1988, Halliburton committed to performing a number of activities in response to a Notice of Violation issued to Halliburton for illegal discharge of wastewater on the above referenced lease tract. One of Halliburton's commitments was to submit to the department by July 11, 1988, copies of a completed environmental audit relative to Halliburton's activities on the lease tract. Another commitment was for Halliburton to submit a sampling and analysis program to the department by July 25, 1988. To date, the department has received neither the environmental audit nor the sampling and

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analysis program. In addition, no communication has been received from Halliburton indicating a need for additional time to submit these documents."

The ADEC letter goes on to state: " It is requested that Halliburton submit the missing documents within fourteen days from the date of this letter, along with a written explanation for their delay." To date, ADEC has received no further correspondence from Halliburton concerning this matter.

As indicated in a photograph, at least 1 acre of dead and discolored tundra is adjacent to the Halliburton pad. (This facility is documented in photo 134.)

Site # 11 VECO Oil Field Service Company - Deadhorse

VECO, Inc. has operated an oil field service facility at Deadhorse since the mid-1970s. The first facility established, called the old VECO base camp, was decommissioned in 1987. At this time, VECO purchased another facility and moved its base headquarters to the new location in Deadhorse. The current VECO facilities consist of the following: a diesel vehicle maintenance shop, a gasoline vehicle maintenance shop, a heavy equipment maintenance shop, a vehicle washing facility, a painting and auto-finishing shop, a carpentry and wood products shop, an electrical supply and service shop, and a welding and steel fabricating shop. The complex also contains a waste incinerator.

After the move to the new location, VECO began decommissioning and demolishing the old camp. The decommissioning continued into 1988. The old VECO base camp was the site visited by the EPA contractor. According to ADEC, VECO has had a history of environmental releases resulting from waste management practices used. For example, according to State officials, 50 gallons of paint were buried in the VECO pad in 1986. According to ADEC, VECO has reported that the paint was cleaned up the same summer, and a report documenting the cleanup was filed with the ADEC.

The pad contained a number of spills, empty drums, large areas of stained gravel, abandoned equipment, and general debris. In one area of the pad, a large number of empty drums were stored, some on the gravel pad and some on wooden supports. The drums were generally in poor condition, exhibiting signs of damage, rust, and corrosion. The composition of the residual contents of the drums is unknown.

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At the time of the site visit, the site contained several large diesel tanks. Diesel fuel was evident in the area inside the containment structures, and the gravel around the tanks was saturated with diesel fuel. A large spill of unidentified material was observed on one side of the pad. According to ADEC, the Department has requested sample data from this area, and VECO has never responded. As documented by photographs, near this spill was a shallow pit used to store oily waste. The liner is tattered and the berms of the pit were breached or very thin in places. A large oily spill was observed floating in standing water under one structure located on pilings on this pad.

Operators of this facility at one time cleaned used drums in the truck washracks and steam cleaned truck tanks that had carried oily wastes and chemicals. According to reports on file with ADEC, VECO disposed of this rinsate at Pad 3; however, Pad 3 has been closed to service companies since 1987. Currently, ADEC is unable to determine where this rinsate was disposed. According to information submitted to EPA by VECO following the EPA contractor site visit, this rinsate was "...returned to the owner as per the contract for that particular project." VECO states that the truck and drum washing operations have been moved to the new facility and are now completely enclosed and winterized.

As previously mentioned, wastes generated at this site are not exempt from any portion of RCRA and are subject to full regulation under RCRA Subtitle C to the extent that they exhibit RCRA hazardous characteristics. (See photos 124 and 125 and 157-163.)

Site # 12 Peak Service Company - Deadhorse

The Peak Service Company provides North Slope operators with a variety of oil field services, and utilizes heavy equipment such as cranes, pumper trucks and construction equipment. On the day of the site visit, many chemicals including corrosion inhibitors, antifreeze, biocides, water treatment chemicals, and cleaning solvents were stored on site primarily in 55-gallon drums. The drums were stored on platforms that were not provided with secondary containment. At the time of the site visit, some drums were in poor physical condition and appeared to be leaking.

At the time of the site visit, three 10,000-gallon acid storage tanks were located on site and provided with secondary containment. This contained area, which was lined with

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plastic, was constructed partially with concrete which had crumbled and decayed in places, presumably from exposure to acid. In areas where the cement containment had decayed, gravel was used to provide secondary containment. One or more of the tanks had apparently leaked as the inside of the contained area was saturated with green-colored spillage. (This site is documented in photos 127 and 153-156.)

Site # 13 Schlumberger Offshore Services Pad - Deadhorse

The Schlumberger Logging Company maintains a service center and employee housing on this pad. Vehicles and logging equipment are stored and serviced in an enclosed structure. A pipeline discharges treated domestic sewage to the tundra under a permit from ADEC, which requires that the discharge meet secondary treatment standards. At the time of the site visit, an oily sheen was observed in the pool of water formed from the sewer discharge. Additionally, oil stains on the tundra and surrounding ice were evident.

On June 30, 1988, ADEC issued Schlumberger a Notice of Violation for the hydrocarbon spill observed on June 17, 1988 (ADEC 1988k; ADEC 1988l). According to the letter accompanying the Notice of Violation: "On June 17, 1988, while inspecting the Deadhorse service area, I observed a hydrocarbon spill on the western edge of the Schlumberger Pad, Lease Tract 13. This spill has not been reported to the department within the prescribed time period allowed by state regulations." The letter goes on to state: "The violation notice requests that the spill be reported, free product cleaned up and a plan for removing contaminated gravel and oil on the tundra be submitted to this department."

On July 14, 1988, ADEC received a letter from Schlumberger outlining their response to the Notice of Violation (Schlumberger 1988; Schlumberger 1988a). Enclosed with the letter was a spill report documenting that the hydrocarbon spill observed on June 17 consisted of approximately 10 gallons of waste oil. According to the spill report, the waste oil spill had affected approximately 160 square feet of tundra. The oil was contained by a boom and soaked up with absorbent. The contaminated gravel and grass was removed and disposed at the Oxbow Landfill oily waste pit. The spill report discusses Schlumberger's plans to revegetate the area with red fescue, tundra bluegrass, and Alyeska

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polargrass. According to the spill report, planting would occur on or about August 20, 1988.

Schlumberger's letter discusses the company's intent to prevent future spills of this type through employee training. In a letter from Schlumberger to ADEC dated September 5, 1988, Schlumberger documents that seeding of the area affected by the waste oil spill was occurring between August 25 and September 10 (Schlumberger 1988b). This letter discusses the seed mixture used and the type and amount of fertilizer used. It also discusses the reseeding techniques employed. According to ADEC, the Schlumberger response to the Notice of Violation represents a more complete response than is usually forthcoming from service companies receiving Notices of Violation from ADEC. (This facility is documented in photos 164 and 165.)

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ADEC, NRO, 1984a. Letter to Sohio Alaska Petroleum Company (Standard Alaska), Re: East Dock Reserve Pit, August 28, 1984.

ADEC, NRO, 1984b. Waste Disposal Permit No. 8436-DB024, October 30, 1984.

ADEC, NRO, 1984c. Letter to Prudhoe Bay Hotel, Re: Waste Disposal Permit 8436-DB018, June 15, 1984.

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L. B. Morse
Field Manager
Prudhoe Bay/ Lisburne Operations

March 9, 1989

Senator J. Bennett Johnston
United States Senate
Hart Building, SH 136
Washington, DC 20510

Dear Senator Johnston:

On behalf of ARCO, I would like to express my appreciation for the opportunity to express our views on S406. We also appreciate your and your Committee's efforts in obtaining a copy of the controversial draft EPA report discussed during the hearing. After a cursory review of its contents, many of the central facts and allegations appear to be quite similar to those contained in a draft site report prepared by VERSAR, Inc. (EPA's contractor) which we saw last fall. ARCO, BP Exploration and the oil contractor community commented extensively on that poorly written, biased and factually defective draft.

While EPA has made certain technical modifications in its draft reflecting these comments, it is remarkable that the new version retains a number of earlier errors. Rather than resolving waste handling issues by requesting factual information, and probing and describing current waste management practices, this new draft again relies heavily on innuendo, old events, and past regulatory programs. It goes on to raise new unsubstantiated and erroneous allegations. At the time that the comments on the VERSAR draft were transmitted to EPA (September 30, 1988), an offer was made to work with the agency to review subsequent drafts and to provide the agency with accurate information. We would hope the agency will entertain our continuing offer to clarify any waste management practices prior to issuing a final report.

As you know, we provided a copy of our earlier comments on the VERSAR version to you at the close of the hearing. We are enclosing another copy for your reference. We do plan to respond to EPA in the future in more detail to any portions of the report which were not included in the original VERSAR version and which raise new issues. We will, of course, forward that analysis to you when it is completed.

While it is frustrating to repeatedly face unsubstantiated charges in the press, we are confident that when this new document is subjected to factual scrutiny and placed in reasonable context, the allegations will lack significance.

Again, we look forward to providing you and the Committee with whatever further assistance may be helpful in enacting this crucial energy legislation.

Very truly yours,

L. B. Morse

L. B. Morse
Field Manager
Prudhoe Bay/Lisburne Operations

Enclosure

LBM/plw

c: Senator Frank Murkowski
Senator Ted Stevens
Congressman Donald E. Young

ARCO response to Versar Report

INTRODUCTION

ARCO Alaska, Inc. ("ARCO") obtained a copy of a document entitled "Draft; Site Assessments - North Slope Alaska" prepared by VERSAR, Inc., a contractor apparently assigned by EPA to collect information on exempt exploration and production waste handling practices. We understand VERSAR's report is to be used as support for EPA rulemaking activity pursuant to Section 8002(m) of RCRA. The draft report details the visit of two VERSAR employees who visited the North Slope oilfields during a three day period in June 1988. ARCO accommodated the requested visit and supplied employees to conduct the EPA contractors to requested locations. Employees were also made available to discuss waste handling practices. Unaccountably, the report is filled with serious mistakes of fact, garbled or out of context statements and incorrect or subjectively biased characterizations of waste handling practices. We believe that the report should be withdrawn, more complete, accurate information collected, and the report rewritten.

ARCO has conducted a cursory review of the report and described in the following pages the most obvious errors in the draft report. We understand that Standard Alaska and the various service contractors mentioned in the report will also be responding to the draft report.

ARCO's preliminary review has revealed a number of categories of deficiencies in the report:

- waste practices criticized as "poor" are either not now being conducted or occur only in exceptional or transient circumstances. For example, contrary to allegations in the report, oily wastes are <u>not</u> dumped into flare pits or reserve pits, sheens on reserve pits are infrequent; "unknown" wastes are not disposed of; general debris is <u>not</u> placed into former gravel pits.

- errors in technical detail abound--despite briefings provided by ARCO field personnel. For example, in Kuparuk, misstatements are made as to well depths, well workover frequency and waste quantities, pigging practices, facility configuration, and many other details.

- errors are made as to the applicability, existence or content of State and federal regulations affecting disposal practices.

- the reviewers clearly lack integrated knowledge of field operations and waste disposal practices; combined with the fact that the visit was conducted during breakup, one

wonders whether the report's judgments were unduly colored by visiting during this naturally sloppy season.

At the time of the site visit, VERSAR staff indicated that the purpose of their tour was to gather information to evaluate waste management practices associated with oil and gas exploration and production activities. The tour was obviously too brief (approximately a half day devoted to each unit) to give even a rudimentary understanding of the field or to allow an adequate transfer of information on North Slope waste handling practices. The numerous factual inaccuracies confirm this view; individual errors may not be important but collectively they are crucial to the value of the overall report and question its merit.

Because of the number of mistaken facts the report needs major revision or re-writing. Further, in our view, VERSAR staff should re-visit the North Slope facilities and re-work their report in conjunction with the Alaska Department of Environmental Conservation (ADEC), the Alaska Oil & Gas Conservation Commission (AOGCC), the North Slope Borough, the North Slope field operators, and the Deadhorse service community. This would produce a finished report which would be accurate and consequently valuable. As is obvious, the economic consequences of relying on an inaccurate or biased report are momentous.

In addition to the factual inaccuracies, there are several statements made in the report which indicate that the VERSAR authors may lack a fundamental understanding of existing regulations. This is evidenced by the statements regarding Drum Disposal Guidelines (40 CFR 261.7) as well as EPA's SPCC regulations. It is also apparent from the report that the VERSAR staff were unaware that jurisdiction over Class II injection wells has been delegated by EPA to AOGCC.

The subjective nature of the narrative is not consistent with a factual representation of North Slope waste handling activities. We believe that the the tone of the report reflects an apparent bias. There are numerous statements which are not only inaccurate, but misleading in context. Areas are rated according to a housekeeping scale with no explanation of the rating criteria. Phrases such as "unknown wastes" indicate (inaccurately) that the unit operators do not know the origin or composition of particular wastes.

There are other statements, such as the description of waste handling practices at Kuparuk mine sites, which may to be quite misleading to an unfamiliar reader. The statement begins by describing ancillary debris brought in with pad snow removal activities and then quickly transitions to oil spill removal activities thereby implying that materials from oil spill clean-ups are stored at mine sites.

The statement is made "that no waste manifest system is used" at the Kuparuk Oily Waste Injection Facility and the Kuparuk Recycling Center. An extensive manifest system exists at both facilities. ARCO was not requested to provide information about this system.

Another problem is the use of incorrect information which is extrapolated to produce unrealistic estimates of large volumes of produced wastes. For example, the incorrect reference to "2 to 3 workovers per day" leads the authors to conclude that more than 300 times the actual volume of workover wastes are produced.

The site visit occurred in June during the spring thaw period known as "break-up." Break-up is a turbulent transition period which lasts approximately one month. This period is characterized by large volumes of snowmelt including sheet-flow of water and is not typical of the normal appearance of the area. At that time of year, all tundra vegetation is still brown from winter kill; it would be very difficult to visibly discern any particular area of tundra was dead. Any trash or debris which has inadvertently become frozen in the snow during winter is visible. Each year worker are employed to pick up trash and debris from the field.

The following comments relate to specific pages of the report.

Executive Summary

Paragraph 2

". . . dumping of oily wastes into unlined flare pits and pigging pits."

ARCO Alaska, Inc. does not dump any oily wastes into unlined flare pits or pigging pits. If pumpable, oily wastes are injected into properly permitted Class II injection wells. During normal flaring operations liquid hydrocarbons are occasionally carried through the flare system and burned off. Pigging pits located at the drillsites are typically lined for emergency relief. Routine pigging of water injection lines occurs but these lines do not contain any hydrocarbons.

Paragraph 2

"dumping of oily wastes into reserve pits."

ARCO does not dispose of oily wastes into reserve pits. In prior years, a central disposal pit was used. However, Kuparuk discontinued disposal of any oily wastes to a single central disposal Pit two years ago. This pit was closed out pursuant to an ADEC

agreement during the summer of 1987. Prudhoe disposes of solid oily wastes into a lined pit at Pad 3, permitted by ADEC.

Paragraph 2

". . . disposing of oily waste, unknown wastes, and general debris into former gravel pits."

This statement is incorrect. Mine site E has been used as a temporary central collection area for winter snow removal from pads. Although a stringent policy against littering and disposal of wastes exists, occasionally some litter is accidentally picked up during snow removal operations. The central depository provides a confined location in which any excess debris may be collected after breakup for disposal at the North Slope Borough landfill. The North Slope Borough landfill is located in an area which was formerly a mine site, but the facility is presently permitted as a municipal landfill and solid waste disposal site by ADEC.

Paragraph 3

". . . Practice of injecting wastes in Class II wells is desirable. . . the performance and integrity of some Class II wells . . . are questionable."

This statement is apparently based on conversations with ADEC officials accompanying the auditors. UIC Class II injection wells are regulated by the AOGCC, not the ADEC. Mechanical integrity tests are routinely performed on Class II wells as required by AOGCC UIC Regulations. We are unaware of AOGCC concerns regarding the performance or mechanical integrity of any Class II wells.

Paragraph 5

". . . Wastes generated by service companies are disposed of on the tundra."

There are no operating practices of which we are aware that would sanction disposal of wastes on the tundra.

New ARCO Drillsite

Page 1

"drilled to depth of approximately 10,000 ft."

- Kuparuk wells are only drilled to about 6,500 vertical depth.

- Discussion of a heavy rig causing damage to gravel road has questionable relevance to a waste report.

Page 1, Paragraph 3

"workover and completion wastes typically contain acids, caustics paraffin breakers (such as the solvent xylene), gels, corrosion inhibitors and a host of other compounds."

This statement is inaccurate. The above-mentioned materials are not used during workover and completion operations. These materials are commonly used in the treatment of wells, flowlines and facilities. Once used, the material is exempt under RCRA. All RCRA exempt fluids are disposed of at an approved facility.

Page 1, Paragraph 4

Statements concerning workovers are inaccurate.

1) There are approximately 600 wells in the field

2) In 1988 only 33 workovers were performed, with only one workover rig in operation doing both well workover and new well completions.

The statement of 2 to 3 workovers per day implies that 730 to 1,095 workovers are performed each year, 1.5 to 2 times the number of wells in the field.

The estimated volume of workover waste of 500,000 BBL is grossly overstated. A typical Kuparuk workover generates approximately 300 BBL of fluid, of which 250 BBL are recycled and used again. This would produce only 50 BBL of waste per workover, or 1,650 BBL of waste annually, not 500,000 BBL.

Page 2, Paragraph 2

Pigging operations are incorrectly described. The only pipelines in Kuparuk which are routinely pigged are the water injection lines. Oil production lines are not pigged. Since the water injection lines are the only lines pigged, paraffin could not accumulate since it is associated with oil production.

"At the location in the pipeline where the pig is removed, a pit is dug and the sludges are dumped into the pit."

The statement, as well as the rest of this paragraph, is inaccurate. At most drillsite facilities with ongoing waterflood operations, pigging pits are lined containment pits where the fluid is evacuated (typically all water). The water is quickly removed by vacuum trucks upon completion of the pigging

operation. The new drillsites, at which water injection is beginning, have no need for pigging operations. Accordingly, these sites do not have lined pigging pits. These new drillsites with waterflood operations are pigged to the reserve pits from which the water is immediately removed. ARCO is currently working with State and Federal agencies on a plan to close or line all open reserve pits, including those used for pigging. During the winter (9 months) the reserve pit berms are frozen solid, thereby preventing migration of any fluids to the tundra and such pits are drained in the summer season.

ARCO Materials Storage & Drum Disposal

Page 3, Paragraph 1

This paragraph is again incorrect. The drum storage area has lined berms; the liner is covered with a lift of gravel to protect the liner from equipment placing drums in the pit. It is interesting that the report states the berm is constructed of large diameter gravel, implying high potential for migration of containments to the tundra, yet they also observed standing water in the area, indicating in fact that the liners were working.

Page 3, Paragraph 1

"visible signs of physical damage" to the drums if true is irrelevant since the drums are empty and awaiting destruction. Physical damage to the drums would result in no environmental effects.

Page 3, Paragraph 2

This paragraph regarding drum handling is incorrect. Drums are not double rinsed, but double drained. No additional fluids/ materials are used or created as implied in the report.

The statement that wastes from drums is not exempt is incorrect. Drums are emptied as specified in 40 CFR 261.7 (b)(1). EPA's own policy defines a barrel as empty when it contains less than one inch of fluid. To the extent that one inch of fluids is recovered those fluids are excluded from RCRA. These exempt fluids are either reused or disposed of at a State approved facility. Kuparuk drum fluids are not disposed of at Pad 3. Operating procedure prohibits acceptance of any barrels which do not meet the empty criterion.

ARCO Abandoned Mine Site - Kuparuk Field

Page 3, Paragraph 3

"there are no State regulatory siting or reclamation requirements for these pits."

Statements in this paragraph are incorrect. ARCO has permits from the Alaska Department of Natural Resources, Army Corp of Engineers and the North Slope Borough requiring mine site rehabilitation and reclamation. ARCO has begun reclamation of Mine Site F at Kuparuk (as well as the Sag C mine site at Prudhoe Bay.) Additionally, numerous revegetation studies and efforts have been conducted with some encouraging results. ARCO is currently working with the Alaska Department of Fish and Game, not the Fish and Wildlife Service, on mine site rehabilitation options.

Page 3, Last Paragraph

This is another inaccurate statement; as worded, it implies that mine sites are used for garbage and debris disposal, which is not true. By juxtaposing a discussion of oil spills, it further implies that oil spills are placed in the mine sites. This is incorrect. Kuparuk Mine Site E has been used to temporarily stage snow removed from pads during snow removal activities. While much snow is cleared off the pads, snow closest to the pad is taken to the mine site to prevent/minimize any ancillary gravel being pushed off onto the tundra. The snow hauled to the mine site sometimes contains gravel and some occasional debris which may have been buried or covered in the snow. As you are undoubtedly aware, the gravel on the pads originally came from the mine sites. Any debris which finds its way into a mine site with the snow removal is cleaned up as the snow melts and disposed of properly in the North Slope Borough landfill.

Page 4, Paragraph 1

". . . hundreds of spills are reported each year. . ."

In context and without further explanation, this is misleading. On average, approximately 150 spills per year occur in the Kuparuk Field. These reported spills, which are as small as one pint, are immediately cleaned up and reported to the ADEC. Oily waste contamination of a mine site is avoided. If noted, any such contamination is cleaned up and reported as required by State and Federal regulations. The report indicates location, source, time of spill, type of material, estimated volume, containment procedures and remedial cleanup action taken. These reports are available from state and federal agencies.

Page 4, Paragraph 2

ARCO's Oily Waste Injection Facility

A number of inaccuracies appear in this paragraph. Although the statement, ". . . wastes would fail the RCRA ignitability characteristic because of their high petroleum content." may generally be correct, what the report fails to note is that these materials are exempt from RCRA disposal regulations. Moreover, flash points of exempt fluids are occasionally below 140°F.

The statement that no waste manifest system is used at this facility is wrong. All oily waste loads are manifested under the Kuparuk Oily Waste Manifest system which is constantly monitored on a daily basis by on-site personnel. Hard copies of the manifests, as well as computerized logs of manifests, are readily available. To our knowledge, the study team did not request to see or to obtain copies of any manifests.

Comprehensive analyses of injected wastes are not conducted. The wastes are non-hazardous due to source, manifested information, and/or they are exempt from the RCRA disposal regulations.

ARCO's Oily Waste Recycling Center - Kuparuk Field

Page 4, Paragraph 4

". . . sludges are disposed of at the Pad 3 oily waste pit. . ."

No sludge generated at Kuparuk is disposed of at Pad 3; all solids/sludges generated at the Recycle Center are properly disposed of at the North Slope Borough Oxbow landfill.

Page 4, Paragraph 5

The statement, ". .inadequate to contain 110% of the volume. . . as required by Federal SPCC regulations" is incorrect. Federal SPCC regulations in fact require secondary spill containment to be sized to contain 110% of the volume of the largest tank plus precipitation; they do not address manifolded tanks. The secondary containment volume surrounding the 2Z settling tanks is sized to contain 110% of the volume of the manifolded tanks, as required by other permits.

Page 5, Paragraph 1

Hose breakdown spillage is not allowed to drain into surrounding gravel. While no high level alarms exist, the facility is manned 24 hours per day, the tanks are manifolded and secondary containment exists. As with the oily waste facility, all loads brought

into the recycle center are manifested and documented, contrary to statements in the report.

ARCO's Pad 3 Oily Waste Disposal Facility

Page 5

Since 1985, when RCRA Interim Status ended, the Pad 3 facility has accepted only exempt or nonhazardous wastes. The disposal wells have been permitted and are regulated by the Alaska Oil and Gas Conservation Commission to which EPA has delegated Class II UIC regulation authority. The ancillary solids disposal pit, permitted by ADEC, is excavated into the permafrost and is fully lined with a polyurethane fabric liner. Thermistors are located beneath the liner and monitor soil temperature. If the soil is frozen, wastes cannot escape or migrate because of intact underlying permafrost, which is impermeable. Where tears in the fabric have occurred, they have been repaired. Activity at these facilities has occurred pursuant to state permits.

Regarding H_2S levels at the facility, liquids and solids arriving at the Pad 3 facility typically have negligible concentrations of H_2S. However, H_2S detection and warning devices are installed at the facility, contrary to the assertion of the report. Further, personnel have received appropriate H_2S safety training.

Flow Stations - Gathering Centers

Page 8, Paragraph 5

"Precipitates and sludges from collection and separation vessels, otherwise known as tank bottoms, are removed approximately once every two years."

Collection and separation vessel wastes are RCRA exempt and consist mostly of formation sand. Volumes are overstated.

Prudhoe-EOA drillsite test separators have needed cleaning once in eleven years. Slop oil tanks have also required only infrequent cleaning.

Page 8, Paragraph 5

"Corrosion inhibitors and biocides are added to these vessels periodically to prevent corrosion from H_2S and sulfate reducing bacteria."

These chemicals are routinely added to the production fluid streams upstream of the vessels and are soluble in these streams. Hence, they do not build up in the vessel sediments.

Page 8, Paragraph 5

"Metals commonly found include lead and chromium,. . . However, no documented chemical analysis was provided for review."

The statements imply that significant levels of metals are commonly found in flow stations vessels. In fact, measured levels are low--one test in 1987 revealed 1 ppm total chromium and 1 ppm lead. This documentation was available when VERSAR visited, but to our knowledge it was not requested.

Page 9, Paragraph 3

"Dirty Water" tanks are present at these facilities. These tanks relieve flow-back from well stimulation and completion operations."

This statement is inaccurate. No well stimulation or completion fluids are directly flowed back to the dirty water tanks. Well stimulation fluids are comingled with produced fluids in the train separators. Well completion fluids are rarely sent to the flow stations. They are typically filtered and reused. When spent, these fluids are disposed into Pad 3 injection wells or pumped down annuli pursuant to ADEC and AOGCC permits.

North Slope Salvage Site

Page 14, Paragraph 1

VERSAR's description of the NSSI incident implies that ARCO/ Standard improperly conducted the cleanup activity. Cleanup was in fact conducted under the guidance of ADEC and EPA personnel who were continuously on-site during the clean-up process. All activities associated with the project, including disposal techniques and monitoring, were accomplished under agency authorization. Liquids that were disposed of at Pad 3 were not RCRA hazardous waste, based on determinations made by both agencies.

Child's Pad Cleanup

Page 14, Paragraph 2

VERSAR's description of the Child's pad cleanup is incorrect. No soil has been removed from the site to date. VERSAR's allegation that contaminated solids from the site were disposed of at the Oxbow landfill is erroneous. An ADEC decision on final disposition of the soil is dependent on the outcome of extensive analysis being performed on soil samples.

VERSAR's statement that no chemical analysis has been done to characterize the liquid waste in the drums is also false. Extensive analytical work, including, but not limited to, RCRA characterization tests, have been performed on samples taken from each drum. This data has been reviewed by EPA and ADEC and both agencies have determined that the fluids are either recycleable oils or non-hazardous waste.

Pingut Pit

Page 17

Information in this paragraph is inaccurate and misleading. The Pingut pit was excavated into permafrost. Thus, no migration of its contents occurred nor is likely to occur. ARCO operated the pit as an oily waste pit under ADEC permits. Prior to closure, the pit contained oily waste which was situated below permafrost grade. Moreover, free oil was continually removed from the pit, such that accumulations of oil were negligible.

Overburden used to fill the pit was not saturated with oil nor has the overburden after closure become contaminated, to our knowledge. As part of the ADEC approved closure plan, any contaminated overburden was placed in the bottom of the pit; a seven foot lift of adjacent uncontaminated material was used to fill the pit followed by an additional two foot cap of fresh uncontaminated gravel. ADEC has required annual monitoring and has not expressed any concern to our knowledge.ARCO is not aware of any contamination of "the surrounding area."

ARCO Drillsite 4

Page 18, Paragraph 1

An oil sheen was first observed in August 1987, not "several years" ago as alleged. A spill report was filed at the time of the incident and a diligent cleanup effort was pursued in 1987 and 1988. Details of this incident are available upon request.

ARCO's Crude Oil Topping Unit (COTU)

Page 18, Paragraph 2

"Naptha is added to the diesel to increase octane for use in gasoline engines."

This statement is incorrect. Naptha is not now produced and has never been added to diesel for use in gasoline engines.

The waste streams claimed to be generated by the COTU are erroneous. VERSAR has misstated facts regarding COTU bundle sludge.

ARCO has not deemed the material to be hazardous waste - testing to date has in fact shown the material to be well below EP toxicity criteria for chromium and other contaminants. ARCO never stated, during the site visit or otherwise, that the sludges were ever sent to an RCRA TSD facility. In addition, as stated to VERSAR, Pad 3 has not been used for COT waste disposal since 1985 when interim status ended. Any oily waste generated at the facility is recycled in full compliance with RCRA regulations.

ARCO Pad 14

Page 21, Paragraph 5

The Relief pit at drillsite 14 is designed to be used for venting excessive gas and pressure during emergency situations. No other waste solids or liquids have been disposed of in relief pits at Pad 14 or at any other sites.

Page 22, Paragraph 1

The description of pigging operations is in error. The "pigging pit" is an emergency pit, which is lined with a Chevron Industrial Membrane liner. The emergency pit is used only to collect sludges and debris from water injection pipeline operations. Lines do not carry hydrocarbons, therefore no solvents are introduced into the pipeline prior to pigging operations as alleged.

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EXECUTIVE SUMMARY

SITE ASSESSMENTS - NORTH SLOPE ALASKA

Between June 14 and 17, Versar Inc. performed environmental site assessments on North Slope oil production facilities. The purpose of the site assessments was to characterize the wastes management practices of the oil companies and the service companies located on the North Slope. The assessment consisted of site inspections and interviews with oil company officials, State of Alaska Department of Environmental Conservation (DEC) officials, and oilfield and service company operators. Video tapes and photos were taken during the site inspections and are referred to throughout the text.

Standard and ARCO, referred to as the two main operators, comprise the bulk of all oil and gas production, drilling, and exploration operations on the North Slope. Waste management practices ranged from good to poor at facilities operated by Standard and ARCO. Some of the poor waste management practices observed at Standard and ARCO facilities include: dumping of oily wastes into unlined flare pits and pigging pits; dumping of oily wastes into reserve pits, oil sheens on the surface of reserve pits; leaking reserve pits resulting in dead tundra; and disposing of oily wastes, unknown wastes; and general debris into former gravel pits. Breakup was occurring during the time of the site inspections. Consequently, many of the oily wastes spilled or disposed of on the ice and snow during the previous winter were visible on the tundra during breakup.

Conversely, some good waste management practices were observed. These included: injecting oily wastes and drilling fluids through centralized Class II injection wells; storing damaged 55-gallon drums in overpack containers; rinsing and removing sludges from used drums and injecting the wastes via Class II disposal wells; and characterizing and storing hazardous wastes in areas provided with secondary containment. While the practice of injecting waste in Class II wells is very desirable, it should be noted that, according to State officials and others, the performance and integrity of some Class II disposal wells on the North Slope are questionable.

Dozens of independent service companies provide Standard and ARCO with a variety of oil field services. Part of this service includes supplying Standard and ARCO with a number of oilfield chemicals. These chemicals include: cleaning solvents, corrosion inhibitors, antifreezes, emulsion breakers, surfactants, acids, bases, biocides, and prescription formulations; lubricants, drilling fluids, drilling muds, and completion and workover fluids. Many of these spent chemicals meet the criteria of RCRA hazardous wastes.

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The waste management practices of service companies varies significantly; however, most are extremely poor. The gravel pads of many service companies showed evidence of frequent chemical spillage. Often the spillage was allowed to drain to the surrounding tundra. Numerous incidents spillage resulting in dead tundra are documented. The chemicals were usually stored in 55-gallon drums or in bulk tanks. The lack of secondary containment for these drums and tanks contributed to the spillage of these chemicals. Many of the wastes generated by service companies are disposed of on the tundra, at former gravel mines, or at the Oxbow landfill. Generally, none of the wastes generated by service companies are characterized for hazardous constituents prior to disposal. Some service companies use unpermitted incinerators to dispose of industrial waste.

The North Slope Borough operates two major disposal facilities on the North Slope, the Oxbow landfill and the North Slope Borough incinerator. The quality of waste management practices varies at these facilities and is discussed in detail in the text.

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SITE ASSESSMENTS - NORTH SLOPE ALASKA

New ARCO Drillsite - Kuparuk Field

The new ARCO drillsite is comprised of a gravel pad with below-grade reserve pits. Wells drilled on this drillsite are for development of the existing field. This site represents ARCO's first use of below-grade versus above-grade reserve pits on the North Slope. Drilling mud and cuttings are discharged into this unlined reserve pit. Upon completion of drilling, the liquids in the reserve pit will be injected down the well's annulus, and the solids will be covered with overburden and frozen into place inside the pit using a method referred to as "freezeback". Additional production wells on this pad will be drilled around the reserve pit and production piping is placed around its perimeter. This new type of reserve pit configuration will allow for easier solids removal. Often times with older reserve pits, production piping was constructed over the pit from one side to the other, thus making it difficult to remove the remaining solids. Wells in this field are typically drilled to a depth of approximately 10,000 feet.

At this particular drillsite, the heavy rig caused damage to the gravel road used as an access. This particular rig, which is reportedly heavier than other rigs used by ARCO, was used for its first time in the 1988 season.

In addition to the drilling rig, a workover rig was in operation at the time of the site visit. This workover rig is used to complete the well and bring it into production once it is drilled to the desired depth. Steel tanks containing the cement and brine solution used in well completions are located adjacent to the workover rig. Additional tanks are used to store displaced fluids generated from the borehole and waste fluids generated from completion and workover operations. These workover and completion wastes typically contain acids, caustics, paraffin breakers (such as the solvent xylene), gels, corrosion inhibitors, and a host of other compounds. Wastes generated during completion and workover operations are disposed of in the Kuparuk Oily Waste Injection Facility, the Kuparuk Recycling Center, the Pad 3 Oily Waste disposal well and pit, or the Oxbow landfill.

According to ARCO personnel, the Kuparuk field contains approximately 400 wells, and workovers of these wells are performed at the rate of two to three per day.

Around 500 barrels of workover wastes are generated per workover per well. It is estimated that over 500,000 barrels of workover wastes are generated from the Kuparuk field annually.

According to ARCO personel, pipelines in the Kuparuk field are routinely pigged. Pigging is a pipeline cleaning process where a metal cylinder is pushed through production piping in order to remove any paraffin or solids which have collected in the piping. Both gathering and production pipelines are routinely pigged. At the location in the pipeline where the pig is removed, a pit is dug and the sludges are dumped into a pit. Many of the drill sites have at least one pigging pit. Upon completion of a pigging operation, the pigging sludges are collected by vacuum truck and are injected at the ARCO Oily Waste Injection facility. At the present, most of the pigging pits in the Kuparuk field are unlined, permitting the potential migration of a variety of hydrocarbon-based contaminants into the surrounding tundra. According to ARCO personnel, ARCO intends to begin lining these pigging pits, although no formal schedule has been proposed.

At the ARCO drillsite, new reserve pits were being prepared for future use. These new reserve pits were partially lined with insulation material to protect the permafrost from melting, which would cause subsidence of the surface. This insulation material will be disposed of in the Oxbow landfill. Overburden from excavation of all pits on site was stacked on one edge of the drillsite. This overburden will eventually be used to close the reserve pits. (Refer to photos 1-7.)

ARCO Materials Storage and Drum Disposal Area - Kuparuk field

ARCO utilizes a central area or pad for materials storage including drilling and completion materials, tubulars (piping), and spare parts. The pad contains a warehouse for storage of some materials, while others are stored outside. This past spring, the facility experienced a chemical spill when drums of methylene chloride arrived in damaged condition. The spilled material and items used to clean up the spill were disposed of as hazardous waste. Eight 55-gallon drums of methylene chloride contaminated materials were shipped to a RCRA Subtitle C Treatment, Storage and Disposal (TSD) facility in the Lower 48 States. According to ARCO personnel, this was ARCO's first shipment of hazardous waste ever from their Arctic operations. Since Alaska has no TSD facilities, operators are allowed to keep RCRA hazardous waste on site for no more than 90 days before shipping to a permitted disposal facility.

Empty drums are stored at the central storage site prior to crushing and disposal. The empty drums previously contained a variety of oilfield chemicals including solvents, acids, biocides, corrosion inhibitors, corrosives, caustics, water treatment chemicals, and a number of hydrocarbon-based chemicals. Empty drums are stacked on wooden crates four drums high. At the time of the site visit, some drums exhibited visible signs of physical damage, rust, and corrosion. The empty drum storage area is surrounded by an unlined berm, which is constructed from large diameter native gravel. On the day of the site visit several inches of water had collected in pools inside the bermed area. The water was severely discolored by the presence of a blackish substance. Foaming action at the surface of the water was evident. Because the bermed area containing the drums is unlined, the potential exists for migration of contaminants into the surrounding tundra.

ARCO uses a private contractor to dispose of empty drums. Drums are double-rinsed, crushed, and sent to the Oxbow landfill. The oil-miscible rinsate is commingled with other oil-miscible wastes and recycled in ARCO's Oily Waste Recycling facility, while other liquid waste is hauled by vacuum truck and injected at ARCO's Pad 3 facility in the West Operating Unit. Wastes from used drums are not exempt from RCRA and are subject to full regulation under RCRA Subtitle C. (Refer to photos 8-12.)

ARCO Abandoned Mine Site - Kuparuk field

In developing the Arctic North Slope oilfields, hundreds of millions of cubic yards of gravel have been mined from various mine sites in the area to construct gravel pads for drillsites, production equipment, pipelines, support services, and an extensive road network. All pads and roads are elevated five feet above the tundra with gravel. The mine sites cover areas on the order of millions of square yards and may be as deep as 40 yards. Usually, between 10 to 20 yards of overburden must be removed and stacked adjacent to the mine site before gravel is reached. There are no State regulatory siting or reclamation requirements for these pits. Consequently, there has been no successful reclamation of any of these mine sites to date. Industry, with the encouragement of the U.S. Fish and Wildlife Service, has proposed a program to create fish habitats by flooding these pits and stocking them with appropriate species of fish. However, no formal plans or documentation have been prepared.

Industry sometimes uses these abandoned sites for disposal of gravel collected from pads during snow removal, and disposal of general garbage and debris. Gravel collected during snow removal from pads often contains contamination from crude oil and chemical

spillage. These spills are common, (hundreds of spills are reported each year) especially during the winter months. The practice of using abandoned mine sites for waste disposal is not a permitted practice and is looked upon with disfavor by the Alaska Department of Environmental Conservation. However, no regulation exists to preclude this practice. (Refer to photos 13-14.)

ARCO's Kuparuk Oily Waste Injection facility

ARCO disposes of non-recyclable oily wastes in their Kuparuk Oily Waste Injection facility. Wastes are received at the facility by tank truck. The driver of the tank truck usually performs the necessary hose connections. The wastes are processed through a shale-shaker, which separates the liquids from the sludges and solids. The oily liquids are injected via a Class II injection well. The oily solids generated by this process are removed by a private contractor and disposed of at the Oxbow landfill via dump trucks.

A comprehensive chemical analysis is not performed on the wastes accepted by this injection facility. According to ARCO personnel, most accepted wastes would fail the RCRA ignitability characteristic because of their high petroleum content. Additionally, no waste manifest system is used at this facility. During the site visit, oily stains were noted on the ground around the unloading area. There is no containment for the unloading area, allowing spills from hose breakdowns to migrate off site. Housekeeping at this site was average in comparison to other facilities in the area. (Refer to photos 15 and 16.)

ARCO's Oily Waste Recycling Center - Kuparuk field

ARCO maintains an oily waste recycling center in the Kuparuk field for wastes containing recoverable hydrocarbons. This facility is similar to a crude oil reclaimer in the Lower 48 States. Hydrocarbons are removed from the incoming oily wastes by a heat treatment process and sent to the crude oil stream. The nonrecoverable liquids are commingled with water destined for ARCO's waterflood operations. The solids and sludges are disposed of at the Pad 3 oily waste pit or the Oxbow landfill. This facility receives oily wastes from well flowback, diesel from hydrostatic testing, pigging wastes, lube oils, workovers, etc.

The oily wastes, received by the facility via vacuum tank trucks, are pumped into a series of four tanks that separate the oil, the water, and the solids. The four storage tanks are surrounded by gravel berms for spill containment, however the volume of the berm is inadequate to contain 110 percent of the volume of the tanks as required by Federal SPCC

regulations. Housekeeping at this facility is poor. Oily stains, presumably from routine spillage, were evident on the gravel around the facility. Spillage was evident from tanks that had over-flowed. None of the tanks are equipped with high-level alarms. The unloading area, which had evidence of chronic spills, is not provided with secondary containment. Consequently, spillage from hose breakdowns is allowed to drain into the nearby gravel, thus allowing the potential for off site migration of contaminants. Oily sheens were visible on the water surface around the unloading area during the site visit. Three other facility storage tanks are contained within a gravel berm, which is lined. A partially lined pit is located immediately adjacent to the recycling facility. ARCO employees in attendance were unsure of the purpose of this pit. No chemical analysis is performed to characterize the wastes accepted by this facility and no manifests accompany the wastes. (Refer to photos 17-22.)

ARCO's Pad 3 Oily Waste Disposal facility

ARCO operates the Pad 3 Oily Waste Disposal facility in the Eastern operating unit of the North Slope field. Structures at this facility include: five injection wells, which were drilled for the purpose of testing the permafrost under different drilling conditions; a large lined oily waste pit; and a process building. The wells were drilled in 1978. The pit was constructed in 1987. ARCO is attempting to permit one of the injection wells as a Class I Nonhazardous injection well.

This facility accepts a variety of liquid oily waste in addition to semi-solid sludges. Examples of incoming wastes include workovers (caustic and acidic), stimulation, acid jobs, perforations, flowbacks, and drum cleaning wastes. The facility also accepts ARCO's and Standard's tank cleaning wastes, which typically includes: tank bottoms; separation vessel cleanings; and heat exchanger bundle sludges from ARCO's diesel fuel producing topping unit.

The Prudhoe Bay field is becoming a sour field (H_2S is now found in gathering and separation vessels in concentrations as high as 1,000 ppm, and new the Lisburne production area has H_2S concentrations of more than 5,000 ppm). Consequently, much of the waste, especially from vessel clean-outs and workovers, will contain increasing concentrations of H_2S and sulfate reducing bacteria. These sulfur containing wastes are highly corrosive. There is no cathodic protection for the injection wells at this facility and no H_2S detection or warning devices are being used. (Note: H_2S concentrations of 600 ppm are fatal to humans.)

In the last few months of 1988, the quantity of waste accepted by the facility dramatically increased. For example, in March of 1988 less than 2,000 barrels of wastes were accepted for disposal for the entire month. In June of 1988, approximately 7,000 barrels of waste were accepted per day. The majority of this waste was injected. The pit, which has a 93,000 barrel capacity and was designed to last for 10 to 15 years, opened for operation in 1987 and is nearing capacity. Currently, the Southeast well is the only one being used for the injection of liquid wastes.

The pump that is used to inject the fluids downhole has a slow leak around its packing material. Fluids from this leak are collected in a 55-gallon drum and returned to the pit.

Typically, wastes are transported to the facility by vacuum truck or dump truck. There is no containment area around the liquid waste unloading pad. Spillage from hose breakdowns are allowed to drain into the nearby gravel. The incoming liquid wastes pass through a series of solids removal processes. The separated liquids are injected while the separated sludges are disposed of in the pit. Incoming sludges or solids, which are not appropriate for injection, are disposed of in the pit upon arrival. These sludges and solids do not enter the separation processes. These solids include sludges from vessel clean-outs and oil-contaminated gravels removed from drillsites. The fluids destined to be injected are tested for pH, gravity and flashpoint. Chemical analysis is not performed on the incoming sludges. According to facility personnel, the flashpoint of the sludge samples is not tested for because they are assumed to have a low hydrocarbon content. A simple manifest accompanies each shipment of incoming waste. The manifest simply indicates the origin of the waste and the approximate hydrocarbon content.

The oily waste pit is lined with a polypropylene liner. At the time of the site visit, the liner had a number of visible cracks around the edges, presumably resulting from its exposure to the extreme cold. It is not known if the liner in the bottom of the pit has similar cracks. There are no monitoring wells or leak detection devices present at the oily waste pit. Thermistors were placed at the bottom of the pit during pit construction to monitor its temperature. These thermistors would not detect thawing and possible horizontal migration of contaminants from the sides of the pits where the liner appeared to be cracked. According to Standard personnel, the pit may be tested for leaks this summer, although the method to be used is undetermined.

Housekeeping at this site is fair. Some oil stains were observed around the solids removal facility. Snow is removed from Pad 3 and deposited on adjacent tundra without sampling the snow for presence of spilled material. A very strong hydrocarbon odor was emanating from the oily waste pit on the day of the site visit. (Refer to photos 25-30.)

Standard's Hazardous Waste Storage Site

Standard operates a hazardous waste storage area on C Pad in the Eastern operating unit. The types of hazardous wastes stored at this facility include off specification fuels and solvents, waste corrosion inhibitors, unknown wastes found in 55-gallon drums, and laboratory wastes. The site consists of a below grade gravel pit that is surrounded on three sides by gravel berms. The 55-gallon drums are placed inside overpack drums as a method of secondary containment. The overpack drums are stacked on wooden supports and are stacked two high. According to Standard personnel, when enough wastes are collected, a shipment will be made to an appropriate RCRA Subtitle C TSD facility in the Lower 48 States. Because Standard does not have a RCRA Subtitle C hazardous waste generator's permit, RCRA hazardous waste cannot be stored for more than 90 days prior to transport and disposal to a RCRA Subtitle C permitted facility.

The bermed area containing the stored drums is unlined. Stormwater that collects in the bermed area is injected down a disposal well, according to Standard personnel. Chemical analysis is not performed on this storm water prior to injection. At the time of the site visit, pools of water from the recent breakup were present in the hazardous waste storage area.

Standard's waste lubrication oil storage tank is located adjacent to the hazardous waste storage area. The tank is surrounded by a separate gravel berm for spill containment. The bermed area around the waste lube oil tank is lined. Incoming waste oils are not characterized by chemical analysis. When the tank is full, the oil is transported to an unknown used oil reclaimer. (Refer to photos 31 and 32.)

Standard's Santa Fe Pad Drum Cleaning and Crushing Operation

A drum cleaning and crushing building is located at Standard's Santa Fe Pad. Standard's oilfield operations produce large quantities of empty drums that are sent to this facility for cleaning and crushing. Drums may contain residues of biocides, corrosion inhibitors, a variety of solvents, emulsion breakers, reverse emulsion breakers, glycol, alcohols, diesel, and various other oilfield chemicals. Employees working in this facility

wear respirators and protective clothing. Drum rinsate generated by this facility is subject to full regulation under RCRA Subtitle C.

Drums are brought to the facility by truck. The condition of the drums vary. Some drums are in good condition, while others are damaged, corroded or rusted. If a drum contains a sizable quantity of liquids, its contents are removed by vacuum truck. The liquid collected by vacuum truck is eventually injected at Pad 3. Solids in the bottom of the drums are removed by hand. Drums are then rinsed in a drum rinsing machine, which sprays jets of warm water into the drum. The rinsate is collected and injected at Pad 3. The rinsed drums are then crushed by an on-site drum crusher. All solids generated during this process, including the crushed drums, are sent to the Oxbow landfill.

Housekeeping at this facility is fair to poor. This facility has no secondary containment provided for the area where incoming drums are stored. The floor drains and floor wash-downs, which likely contain contaminants from drum rinsate, empties unmonitored and uncontrolled to the gravel pad beneath the facility. The gravel area around the facility building showed evidence of oily stains. (Refer to photos 33-38.)

Flow Stations - Gathering Centers

ARCO and Standard operate large collection and separation facilities on the North Slope to separate the oil/water/gas from all fluid produced in the Prudhoe Bay field. After separation, much of the water and natural gas is re-injected into the producing formation, while the oil is sent to the Aleyska Pipeline. (ARCO refers to these facilities as "flow stations" and Standard refers to them as "gathering centers".) These facilities process approximately two million barrels of oil per day, along with equally large volumes of produced water and natural gas.

These facilities generate a variety of wastes. Precipitates and sludges from collection and separation vessels, otherwise known as tank bottoms, are removed approximately once every two years. It is estimated that thousands of barrels of tank bottoms are removed annually. As the Prudhoe Bay field grows older, it is anticipated that more solids will be inherently present in the production stream. This will increase the need for vessel cleanouts and thus produce more and more tank bottoms. Corrosion inhibitors and biocides are added to these vessels periodically to prevent corrosion from H_2S and sulfate reducing bacteria. The tank bottoms are disposed of at the Pad 3 facility. Chemical analysis is occasionally performed on tank bottoms. Metals commonly found include lead

and chromium, according to Standard personnel. However, no documented chemical analysis was provided for review.

Glycol is used in large quantities to heat the oil emulsions during the separation process. The glycol is continually filtered using sock filters or charcoal filters. These filters are sent to the North Slope Borough incinerator for disposal. (Charcoal filters are used to remove chlorinated hydrocarbon contaminants from the glycol.)

"Dirty water" tanks are present at these facilities. These tanks receive flow-back from well stimulation and completion operations. Both solids and liquids are recovered in these tanks. The liquid portion of this waste is disposed of through injection wells located on site, while the solids are disposed of at Pad 3.

Each separation facility has large reserve pits or emergency pits to contain spillage from fire suppressant systems. The medium in these systems is usually water, water mixed with fire retardent chemicals, or proprietary chemicals. At Gathering Center 3 (the separation facility toured) these reserve pits contain a red-colored algae that is striking in appearance. Site personnel do not know the cause of this algae growth. (No photos are available of this site because cameras are not allowed inside these gathering facilities.)

Standard's Base Operations Camp Sewage Treatment Plant

Standard has one of two NPDES permits for discharge of treated sewage onto the tundra. Sewage from the Base Operations Camp is treated at the sewage treatment plant and discharged directly to the tundra. Solids are incinerated on site. (Refer to photos 39-40.)

Standard's Y Pad Drill Site

Standard's Y pad is a typical drill site in the Prudhoe Bay field. Production and injection wells are arranged around a reserve pit. The reserve pit is used to contain muds and cuttings from development drilling on the pad. The reserve pits are constructed above grade and provide little or no freeboard for the contents of the reserve pit. Production and injection piping crosses the reserve pit in a number of places.

Until the 1987 season, Standard discharged the liquid contents of these reserve pits directly to the tundra. This process is termed "dewatering a reserve pit." (ARCO is involved in litigation with NRDC at this time over discharge of reserve pit fluids to the

tundra. ARCO dewatered their reserve pits through tundra discharge during the 1987 season.) Standard continues to use the reserve pits for storage of drilling mud and cuttings, while ARCO is using mud tanks to contain drilling mud and cuttings and is constructing below-grade reserve pits for use on new drill sites.

At the time of the site visit, development drilling was underway and mud and cuttings were being discharged to the reserve pit. Other unidentified wastes had also been placed in the reserve pit. Some of these substances appeared to have an oily composition, while others appeared to contain a thick, beige substance swirled in oil. Operators on the North Slope are required to segregate wastes such as workover wastes, and completion and stimulation wastes from drilling mud and cuttings. Failure to do so is a violation of State regulations in Alaska.

At the time of the site visit, breakup was underway and substantial quantities of snow had not yet melted in the reserve pit. According to industry and State personnel, snow is routinely removed from the surface of the pads at breakup each year, and in many instances, is deposited on adjacent tundra. Crude spills and chemical spills are common during the winter months. The potential exists for spilled material to remain in the snow that accumulates on the pads. Thus, the spilled material is discharged to the tundra when the snow is removed and placed on the tundra. (Refer to photos 41-47.)

Fraley Service Company - Deadhorse

The Fraley service company provided North Slope operators with a variety of support services. The Fraley site in Deadhorse is now abandoned. Fraley is a subsidiary of Massey-Ferguson. The site consists of several dilapidated structures located on a gravel pad. Hundreds of used vehicle-type batteries were disposed of or abandoned on site. In some cases, the batteries were strewn about the ground or were found inside the structures.

Between 20 to 30 55-gallon drums were abandoned on site. Some of the drums appeared to be empty, while others were partially full. The contents are unknown. Due to the physical condition of some of the drums, spillage was evident.

The predominant structure on site is a steel building with a wooden floor. The floor of this building was heavily saturated with oil and appeared black in color. Gasoline and diesel vapors inside the building were noticeable. In addition to debris, including half-empty drums whose contents are unidentified, used machine parts, tools and various other containers were present inside the building.

The gravel pad surrounding the steel building showed evidence of numerous spills. The spillage was dark in color and had a predominant hydrocarbon odor. Some of the spillage appeared to have flowed into the adjacent tundra lagoon. Trash and debris were present in this lagoon at the time of the site visit. According to State personnel, at one time this lagoon was full of sewage from Fraley and other facilities. Since the contaminants in the lagoon posed a health threat, operating facilities on this pad now pump sewage a further distance onto the tundra, according to State personnel. Large algae mats are still visible from the sewage discharges in this lagoon, and much of the tundra around this area is dead. (Refer to photos 48-54.)

Deadhorse Hotel Lease Tract

The Deadhorse Hotel lease tract has historically been the site for staging support services for Prudhoe Bay oil and gas operators. The hotel is currently abandoned, and a variety of wastes generated by oilfield support services have been abandoned on site including dozens of empty and partially full 55-gallon drums, unused chemicals, used batteries, abandoned tanks and vessels, steel parts, and general debris. Some of the partially full drums contain lube oil, arctic pack, and unidentified substances. The condition of these drums was fairly poor and spillage was evident from a few of these drums.

Large piles of garbage were stacked in piles on site. The garbage contained a variety of waste including municipal wastes, painting wastes, used vehicle batteries, and engine oil filters. An on-site incinerator, which is unpermitted according to State officials, appeared to have been used to incinerate industrial and municipal wastes. Large piles of incinerator ash were evident near the incinerator. The ash potentially contains hazardous constituents, such as heavy metals. Stormwater runoff from the ash piles drains uncontrolled to the surrounding tundra.

The site was previously used as a diesel fueling station for vehicles. Two diesel fuel tanks, each with an estimated capacity of 10,000 gallons, are currently in use. Diesel spills and odors were evident near these tanks, and some areas were so saturated that diesel fuel was floating in pools on the gravel pad. The spilled diesel fuel has the potential to migrate off the pad into the surrounding tundra. According to State personnel, there have been instances where spillage washed across the road serving this facility and entered the adjacent lake, which is the primary source of drinking water for Deadhorse.

In one corner of the pad was an especially unsightly spill area. Stormwater runoff carried a thick unidentified white substance from the pad to the tundra. Fuel spills and other unidentified substances have completely saturated the gravel pad in this area. An attempt had been made by service companies operating on the pad to clean up the spill with absorbent materials. This attempt appeared to be severely inadequate.

According to the July 6, 1988 Regulatory Determination, which clarified the types of wastes subject to RCRA, wastes generated from this oilfield support services site are subject to full regulation under RCRA Subtitle C. (Refer to photos 55-67.)

Aurora North Fuel - Deadhorse

Aurora North Fuel oilfield service company has an abandoned facility in Deadhorse. This facility contains dozens of used drums, machinery parts, and general debris. Leakage was evident from a few of these drums, whose physical condition appeared poor. The drums were placed directly on the gravel pad without secondary containment, allowing for the potential for drum contents to migrate onto the nearby tundra. Some of the drums contain unidentified substances. Others had labels indicating that hydraulic fluid, motor oils, and diesel fuels were present. Some absorbant materials were placed around the leaking drums in an attempt to contain the spillage. There are numerous fuel spills over the gravel pad. As previously mentioned,wastes generated at this site are subject to full regulation under RCRA Subtitle C. (Refer to photos 68-71.)

B. J. Titan Oilfield Services - Deadhorse

B. J. Titan operates an oilfield services facility in Deadhorse. Dozens of used drums were stacked in arbitrary fashion on site. Most drums were placed directly on gravel pad, without secondary containment. Many of the drums were in poor condition, exhibiting signs of damage, rust, and corrosion. While many of the drums contained unidentified liquids, some had labels indicating that corrosive liquids were present. The lack of secondary containment allows for potential migration of contaminants off site and onto adjacent tundra. The site contained a large number of crushed drums. The disposal practices of the drum rinsate prior to crushing is unknown.

B. J. Titan maintains acid tanks and an acid washout area adjacent to the tanks. The acid tanks lacked adequate secondary containment. Acid spills in this area were evident from the discolored gravel. The acid washout area was not provided with secondary containment and could potentially allow the migration of contaminants off site onto the

tundra. There was evidence of cement spillage onto the tundra from the the pad. The tundra in this area was dead. The housekeeping at this facility was poor, as indicated by large, dark oily stains and an unidentified white substance on the pad.

As previously mentioned, wastes generated at this site are subject to full regulation under RCRA Subtitle C. (Refer to photos 72-77.)

Forward Alaska Service Company

Forward Alaska oilfield service company abandoned a site in Deadhorse located adjacent to the lake which is the source of all drinking water for facilities on the North Slope. The North Slope Borough is responsible for this drinking water. Waste management and housekeeping on this site was poor. A wooden structure, used to store a variety of used drums, batteries, and general debris is supported a few feet above the pad. The gravel pad around this structure is stained with spillage. Damaged drums were abandoned in horizontal positions thus providing the potential for any contents to escape onto the gravel pad. Most of the drums are in very poor condition, exhibiting signs of damage, rust, and corrosion. Several of the drums display methylene chloride labels. There was no secondary containment around this storage area.

As previously noted, this site is directly adjacent to the lake from which the North Slope Borough draws all water for domestic use. On the day of the site visit, runoff from under the wooden storage structure was flowing into this lake. While the runoff was occurring because of breakup, the potential exists for contaminants to migrate into the lake. Signs of erosion from the site into the lake were evident around the storage area.

An on site building was once used for staging oilfield service activities and storing oilfield chemicals. The floor of this structure was saturated with oil. Partially empty drums containing a variety of oilfield chemicals, including isocyanate compounds, were present in this structure. Some of the drums were in poor condition.

On one side of the facility, a large number of used drums were stored directly on the gravel pad. At the time of the site visit, these drums were almost at water level because of breakup. There is no secondary containment around these drums and thus allows the potential for migration of contaminants from these drums onto the tundra. (Refer to photos 78-81.)

North Slope Salvage site

North Slope Salvage Inc. (NSSI), a facility that accepted used oilfield drums, was responsible for an uncontrolled release of contaminants to the tundra during the breakup in 1983. Approximately 14,000 used and partially full 55-gallon drums of oilfield chemicals were stored on site without secondary containment. These drums leaked for an unknown period of time before being discovered. The Alaska Department of Environmental Conservation discovered the spillage in 1983 and requested Federal enforcement at that time. Federal action was never taken. After an inadequate cleanup effort was mounted by NSSI, ARCO and Standard paid for additional site remediation because they were the primary contributors of the drums at the site. The liquids, primarily mixtures of solvents, oils, fuels, and corrosion inhibitors, were collected by vacuum tank trucks and were either sold as boiler fuel or injected at ARCO's Pad 3. These recovered liquids qualified as RCRA hazardous waste because of their low flashpoint, according to State personnel. No chemical monitoring or sampling of surrounding tundra was conducted in order to determine the adequacy of the site cleanup. (Refer to photos 82-85.)

Child's Pad

In the spring of 1987, the Alaska Department of Environmental Conservation discovered that a large number of oilfield drums were inappropriately stored on Child's Pad in Deadhorse. According to State officials, the drums were leaking used oil and oilfield chemicals onto the tundra. Additionally, solid wastes including municipal trash, used batteries, and painting waste were discovered on site. The company responsible for the pad was bankrupt and did not cooperate with the State's request for cleanup. After the incident received publicity, ARCO and Standard agreed to pay for cleanup of the site.

During cleanup, the solid wastes were segregated and disposed of at the Oxbow landfill. Contaminated soil was also disposed at the Oxbow landfill. At the time of the site visit, the recovered liquid wastes and leaking drums were being stored in overpack drums on site awaiting final disposal. The State deemed the liquid wastes to be non-hazardous, although no chemical analysis had been performed to characterize these wastes. (Refer to photo 86.)

Oxbow Landfill

The Oxbow landfill, operated by the North Slope Borough, is the primary disposal site for municipal and industrial waste on the North Slope. The landfill is the site of an abandoned gravel mine. The landfill has two pits, one very large pit for industrial and municipal waste, (the original gravel mine site) and one smaller pit designated for oily waste.

The oily waste pit was opened in 1987 and was designed to last for 15 years. However with increased pressure on North Slope operators to cease discharge of reserve pit fluids to the tundra, much reserve pit waste has been disposed of in the oily waste pit. After only one year of operation, the oily waste pit is nearing capacity. A sump, which is a low lying area within the oily pit, has been created to collect any free oil and stormwater contained in the waste pit. It is not known how the operators dispose of the liquids collected from the sump.

The oily waste pit is constructed from gravel and is not provided with a liner, nor does it have any type of monitoring system to detect leakage. Thermistors are placed around the pit to monitor temperatures. Presumably, the permafrost around the pit prevents the liquids from migrating. The generators do not provide the landfill operators with a chemical analysis of the waste prior to disposal. Additionally, no chemical analysis of the waste is performed by the landfill operators before or after accepting the waste. It should be noted that the service companies on the North Slope have no oily waste disposal site other than the Oxbow landfill. As previously mentioned, wastes generated by service companies are not exempt under RCRA and are therefore subject to full regulation under RCRA Subtitle C.

The main pit at Oxbow is operated as a sanitary landfill. Similar to the oily waste pit, the main pit is constructed from gravel, it does not have a liner, and it does not have any type of leak detection system. Thermistors are placed around the pit to monitor temperature. Permafrost serves as the only barrier to prevent the release of contaminants. Incoming wastes are not characterized by the the landfill operators. According to State officials, the landfill has served, and continues to serve as the disposal site for most of the wastes generated by North Slope oilfield operations. The wastes disposed of at the landfill include: airplanes, vehicles, used machinery, crushed or empty drums, building materials,

insulation, tires, incinerator ash, municipal waste, and a variety of industrial waste. Waste lumber is routinely burned on site. The landfill is approximately half full.

On the day of the site visit, a significant volume of industrial and municipal waste was exposed. Seagulls were feeding on large piles of what appeared to be incinerator ash. (Incinerator ash from the North Slope incinerator is disposed of at the Oxbow landfill. The North Slope incinerator, located in Deadhorse, accepts both industrial and municipal waste.) According to State officials, the North Slope Borough has improved its housekeeping at the Oxbow in response to the debate over leasing on the Arctic National Wildlife Refuge.

The site has no established guidelines for stormwater management. According to State officials, water resulting from snow melt in the pit carries contaminants containing high levels of metals and organics to the Put River, which is directly adjacent to the landfill. A sump located inside the pit was created several years ago to collect snow melt. The operators are in the process of closing this sump. The final disposal methods of the sump fluids are unknown.

In 1988, the landfill operators initiated an aggressive snow removal program to remove as much snow as possible from the pit before it melted during breakup. As a result of this snow removal program, large mounds of snow, containing gravel, debris, and potential contaminants from the pit, were deposited in a designated area on the tundra. It is likely that the tundra under the mounds of snow and gravel will be killed. This snow removal activity provides the potential for migration of contaminants found in the snow. (Refer to photos 87-98.)

North Slope Borough Municipal Incinerator

The North Slope Borough operates an incinerator in Deadhorse. The incinerator accepts primarily municipal waste, however some industrial waste is accepted. For example, according to Standard personnel, all used filters generated in the large gathering centers and flow stations are sent to the North Slope Borough incinerator. These include glycol heat transfer filters, sock type filters, and charcoal filters.

According to State officials, the incinerator operates at approximately 800° F, and was just recently fitted with an electrostatic precipitator to remove particulates. This operating temperature is significantly lower than operating temperatures of other municipal incinerators in other parts of the country. For example, the Ogden Municipal Systems plant

in Alexandria, Virginia operates between 1,400° and 2,400° F. The operating permit for this facility specifies a minimum operating temperature of 1,400° F. High operating temperatures are required for burn efficiency and destruction of potential organic hazardous constituents (POHCs) and other toxic compounds. This facility was not toured during the North Slope visit. (Refer to photo 99.)

Pingut Pit

Pingut pit is an old, deep reserve pit that was later operated by ARCO as an oily waste pit. The pit was never lined, and no leak detection system was ever used. Incoming wastes were never characterized prior to disposal. The pit was closed in the summer of 1986 after ADEC issued a Notice of Violation. Prior to closure, the pit contained eight to ten feet of oily waste at the surface. During breakup, water in the pit overflowed its dikes and allowed the migration of oily contaminants into the surrounding area. According to State officials, the overburden used to cover the pit and surrounding dikes are saturated with oily waste. After closure, the surrounding area was not monitored nor was cleanup of the surrounding area undertaken. At the time of the site visit, the old pit area was discolored and appeared to contain large quantities of oily waste. (No photos of this site were taken . This site is documented on video tape.)

East Dock Pits

The East Dock pits are abandoned Standard reserve pits constructed near the original discovery well site on the North Slope. The pits have been closed. Generally speaking, revegatation efforts on closed reserve pits on the North Slope have met with little success. According to State officials, Standard was to conduct a revegatation study on these reserve pits to research ways to successfully revegatate closed pit areas. Different levels of overburden were to be placed over the pits in order to document the effects of overburden levels on revegatation success. To date, no overburden has been placed on any of the closed pits at East Dock. (No photos of this site were take. This site is documented on video tape.)

Old Surfco Landfill - ARCO Fire Training Facility

ARCO currently uses the old Surfco landfill site as a fire training facility. The landfill was closed in 1979-1980. According to State officials, all industrial waste generated on the North Slope was disposed of at the Surfco landfill prior to opening of the Oxbow landfill.

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ARCO Drillsite 4

ARCO Drillsite 4 has experienced repeated problems with soil and sediment contamination on the west side of the drill site. It appears that material containing diesel fuel has leached from the reserve pit, under the road on the west side of the pad, and into the tundra on the west side of the road. (Oil-based mud is used in drilling some wells on the North Slope.) At the time of the site visit, the water around the tundra on the west side of the road was covered with an oil sheen, and the same oily material had flowed into the tundra. According to State officials, they have asked ARCO personnel three times in the past several years to perform cleanup on this site. ARCO has yet to comply with this request. (No photos of this site were taken. This site is documented on video tape.)

ARCO's Crude Oil Topping Unit

ARCO operates the crude oil topping unit used to make fuel for the many vehicles on the North Slope. The unit was one of the first permanent installations built on the North Slope during the initial development of the Prudhoe field. The topping unit breaks out the diesel fraction of crude oil. Naptha is added to the diesel to increase octane for use in gasoline engines. According to ARCO personnel, jet fuel has been made at the topping unit in the past.

The site generates various waste streams including: water distilled off the crude oil, sulfur from H_2S removed from crude oil, vessel bottoms (tank bottoms), heat exchanger bundle sludges, and solvents used for cleaning the vessels and heat exchangers. According to ARCO personnel, the vessel bottoms are removed every two years while the bundle sludges are removed every few months.

ARCO has deemed the bundle sludges to be RCRA hazardous because they failed the EP toxicity test for chromium and the RCRA characteristics test for ignitability. According to ARCO personnel, the bundle sludges are to be sent to a RCRA permitted TSD facility. However, to date no documented shipment of bundle sludges has been made to a RCRA permitted facility. Pad 3 is used as the disposal facility for most wastes generated at this facility. State officials suspect that the flare pit behind the topping unit has been used in the past to burn many of the wastes generated at this facility. Wastes generated at the topping unit, which are similar to the wastes generated at oil refineries in the lower 48 States, are not exempt from any portion of RCRA and are subject to full regulation under RCRA Subtitle C.

ARCO maintains a diesel fuel storage facility adjacent to the topping unit. It was noted during the site visit that portions of the berm surrounding the large storage tank appeared to be saturated with oil. (Refer to photos 100-104.)

Nabor's Pad - Dowell-Schlumberger - Deadhorse

Dowell-Schlumberger (DS), a large, worldwide oilfield service company, has a facility in Deadhorse. DS maintains their own pad and leases a portion of Nabor's pad, adjacent to their own, for equipment storage. DS provides downhole completion and workover services and sells various acids, completion chemicals, solvents, and dry materials such as cement.

On the day of the site visit, ADEC discovered a large, unreported spill of an unidentified substance that had killed approximately two acres of tundra. The source of this spill appeared to be from Nabor's Pad (According to State officials, dead tundra will not revegatate once the tundra mat is saturated with a contaminant such as diesel fuel.) The tundra was blackened where the spill had taken place, and a faint odor of diesel was detected while walking over the dead tundra.

On the pad itself, hundreds of gallons of unidentified spilled materials were observed. A large pile of chalky white material was stacked up on one edge of the pad. The pile also contained some dark, oily material. The pile of material was not provided with secondary containment. The gravel around the pile was stained with rust colored chemicals. Various other spills and stains were observed around the equipment storage area used by DS.

On the DS pad, many more examples of poor housekeeping were found. Approximately 50 leaking drums were found in one corner of the DS pad. The unidentified substance leaking from the drums appeared milky white and gave off a very strong chemical odor. Significant amounts of an unidentified white substance were observed flowing off the pad into the tundra. This material also gave off a strong chemical odor. According to State officials, the area of tundra behind this pad (it is surrounded by various other service companies) has been especially impacted by spills and bad housekeeping. It is estimated that this area contains ten acres of dead, contaminated tundra. Erosion from runoff was observed on the edge of the DS pad immediately adjacent to the leaking drums. There was no containment around the drums.

On another corner of the DS pad, more large spills were observed around a materials staging area. One spill was comprised of a dry, chalky substance, while another appeared as a white milky substance. Yet another spill area contained a frothy, milky substance with small capsule-bubbles that appeared red, orange and green in color. All of these materials had flowed onto the nearby tundra.

Waste management practices were severely lacking at this facility. Housekeeping practices were extremely poor. It should be noted that ADEC intends to pursue regulatory action against DS due to the spills observed during the site visit. As previously mentioned, wastes generated by this service company are not exempt from any portion of RCRA and are subject to full regulation under RCRA Subtitle C. (Refer to photos 105-120.)

N.L. Baroid

The N.L. Baroid service company utilizes good environmental management practices on its pad, when compared to other service companies. N.L. Baroid supplies drilling muds, cement, and a variety of dry bulk chemicals. Some liquids in 55-gallon drums are also stored on this pad. All materials were neatly stored and stacked in boxed columns. Most of the drums and bags appeared to be in good shape and very few were found to be leaking. Spillage on the pad was noticeably absent, especially compared to the other service company pads. Some spillage was evident around a diesel fuel storage tank. However, a gravel berm lined with plastic appeared to contain most of the spillage. (This facility is documented on video tape).

Halliburton

Halliburton is a major service company on the north slope specializing in acids, frac fluids, and other drilling, stimulation, and completion fluids. A former sewage lagoon is located adjacent to the Halliburton pad. According to ADEC personnel, Halliburton dumped unknown quantities of acids and chemicals for a number of years into this lagoon. After the ADEC pursued Halliburton for site remediation, a letter of agreement was drafted by the State's Attorney General requiring Halliburton to clean up the site. To date, no cleanup or site remediation has been performed. As indicated in the video tape, at least one acre of dead and discolored tundra is adjacent to the Halliburton pad. During the site visit, numerous spills from both 55-gallon drums and bulk storage tanks were evident. (This facility is documented on video tape and on photo 134.)

VECO Oilfield Service Company - Deadhorse

VECO operates an oilfield service company in Deadhorse. Historically, operators of this pad have utilized undesirable waste management practices. According to State officials, fifty gallons of paint were buried in this pad two years ago. The Department of Environmental Conservation has requested for two years that the paint be removed and cleaned up. At one time, this facility used an unlined pit excavated in the gravel pad to dispose of used oil. This pit has been filled, however no cleanup has been conducted around the pit area. Operators of this facility clean used drums in the truck washracks and State personnel suspect that the resulting rinsate is discharged on the pad.

This pad contains numbers of spills, empty drums, large areas of stained gravel, abandoned equipment, and general debris. In one area of the pad, a large number of empty drums were stored. Some of the drums were stored on the gravel pad while some were stored on wooden supports. The drums are generally in poor condition, exhibiting signs of damage, rust, and corrosion. The composition of the residual contents of the drums are unknown.

The site contains several large diesel tanks. The housekeeping around these tanks is very poor. Diesel fuel was evident in the area inside the containment structures, and the gravel around the tanks was saturated with diesel fuel. A large spill of unidentified material was observed on one side of the pad. Near this spill was a shallow pit used to store oily waste. An unsuccessful attempt has been made to line the pit. However, the liner is tattered and the berms of the pit are breached or very thin in places. A large oily spill was observed floating in standing water under one structure located on this pad.

Waste management practices and housekeeping at this site were poor. As previously mentioned, wastes generated at this site are not exempt from any portion of RCRA and are subject to full regulation under RCRA Subtitle C. (See photos 124-125 and 157-163.)

Arco Pad 14

ARCO's Pad 14 is an oil and gas production facility that includes: one main structure where oil and gas are separated; a reserve pit; a relief pit; and a pigging pit. The relief pit, which is located on the far edge of the pad adjacent to the tundra, is made of unlined gravel berms. When gas pressure in facility vessels becomes too great, the gas is

vented to this pit, which is similar to a flare pit. Oil sheens and spillage were evident on the surface of this pit. It is not known whether the pit was used to dispose of other wastes.

The pigging pit, which is located near the main structure, is lined with an asphalt material. The pigging pit collects sludges and debris from pipeline cleaning operations. A pig is inserted in one end of a pipeline, including gathering lines, and is pushed through the line by pressure. The pig is removed at the pigging pit, where the sludges and debris are allowed to fall into the pit. Sometimes solvents, such as xylene, are introduced into the pipeline prior to pigging in order help dissolve the sludges and paraffins. The solvents are also discharged into the pigging pit upon pig removal. The final disposal methods of the materials discharged to the pigging pit are unknown. (This site is documented on video tape). (See photos 152, 128, and 129.)

Standard G Pad

Standard's G Pad is an oil and gas production facility that has one main structure, where oil and gas are separated, and a large unlined reserve pit. At the time of the site visit, an extensive oil sheen was observed on the surface of the reserve pit. Additionally, the pit appeared to be leaking as evidenced by dead oil-saturated tundra adjacent to the pit (see video tape). Drilling muds and cuttings, water and drilling fluids, and other debris are stored inside the reserve pit. According to State personnel, this pit overflowed in 1987 and discharged a large quantity of drilling muds and cuttings to the tundra. In the spring of 1988, Standard removed 8,500 cubic yards of drilling muds and cuttings and disposed of this material at the Oxbow Landfill. Fluids in the reserve pit are disposed of via annular injection. (This site is documented on video tape and photos 144-148).

Standard J Pad

Standard's J Pad is similar in design and operation as Standard's G Pad. In 1987, the J Pad reserve pit breached and spilled its contents into a nearby tundra pool, according to State personnel. At the time of the site visit, the spillage had been removed, although there were signs of some stained tundra outside of the repaired reserve pit. (This site is documented on video tape and photos 122 and 123).

Peak Service Company

The Peak service company supplies North Slope operators with a variety of oilfield chemicals. These chemcials include corrosion inhibitors, antifreezes, biocodes, water

treatment chemicals, cleaning solvents, and specialty lubrication and hydraulic oils. The chemicals are stored primarily in 55-gallon drums. These drums are stored on platforms which are not provided with secondary containment. At the time of the site visit, some drums were in poor physical condition and appeared to be leaking.

Three 10,000-gallon acid storage tanks located on site are provided with secondary containment. This contained area, which was lined with plastic, was constucted partially with concrete and partially with gravel. One or more of the tanks had appearantly leaked because the inside of the contained area was saturated with green-colored spillage. (This site is documented on video tape and photos 127 and 153-156.)

Schlumberger Logging Company Pad

The Schlumberger Logging Company maintaines a service center and employee housing on this pad. Vehicles and logging equipment are stored and serviced in an enclosed structure. A pipeline discharges facility sewage directly to the tundra. At the time of the site visit, an oily sheen was observed in the pool of water formed from the sewer discharge. Additionally, oil stains on the tundra and surrounding ice were evident. It is not known why Schlumberger Logging discharges oily wastes through their sewer discharge. (This facility is documented in photos 164 and 165.)

Standard Endicott

The Endicott facility constructed by Standard is an ambitious undertaking, especially considering the climatic conditions on the North Slope. Endicott is an oil and gas drilling and production facility built on gravel approximately five miles from shore in the Arctic Ocean. At the time of the site visit, drilling was being performed on a section of the Endicott facility. Drilling muds, cuttings, and fluids are discharged directly into the Arctic Ocean via a permitted NPDES outfall. Waste treatment is not performed prior to discharge. According to State officials, the NPDES discharge has disrupted the migratory pattern of nearby arctic aquatic life. Additional studies are required to determine the extent of the damage, according to State officials.

The Endicott gravel mine is located onshore near the Endicott facility. Millions of cubic yards of gravel have been removed from this site. Since there are no State regulatory siting or reclamation requirments for gravel pits on the North Slope, there has been no successful reclamation of any of these gravel mines. (The Endicott facility and gravel mine are documented in photos 130, and 135-142.)

BP AMERICA

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March 8, 1989

The Honorable J. Bennett Johnston
Chairman, Senate Energy &
Natural Resources Committee
360 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Chairman Johnston:

BP America obtained a copy of the EPA staff draft "Report on Management of Oil and Gas Wastes on Alaska's North Slope" at midday yesterday, March 7. BP Exploration has completed a quick review of this draft which is attached. If you determine that the EPA draft is part of the record of the Senate Energy Committee March 6th hearing, I would appreciate your consideration of also including the BP Exploration comments on the draft in the hearing record.

Sincerely,

Roger Herrera

Roger C. Herrera
Executive Consultant
BP Exploration (Alaska), Inc.

Attachment

NORTH SLOPE WASTE MANAGEMENT ISSUES

Evaluation of the U.S. Environmental Protection Agency Staff Draft Report:

"MANAGEMENT OF OIL & GAS WASTES ON ALASKA'S NORTH SLOPE"

BP EXPLORATION (ALASKA) INC.

March 7, 1989

EXECUTIVE SUMMARY

BP Exploration (BPX) has reviewed the EPA staff Draft "Report on Management of Oil and Gas Wastes on Alaska's North Slope" which was released recently to the press without EPA's knowledge. Our review confirms the conclusions reached by the Director of EPA's Office of Solid Waste, Sylvia K. Lowrance, as stated in the March 6, 1989 memo to the Senate Energy Committee from the EPA's Office of External Affairs:

> [The draft report] is poorly written and organized. It includes a mix of fact from EPA site visits with conjecture from non-EPA sources. The report has had limited management review. That preliminary review resulted in significant concerns about the quality of the report which dictates substantial additional work before this document will be finished.
>
> As written, although there appears to be some useful information in the report, it goes beyond what can be documented and is not an objective portrayal;

BPX has found major deficiencies in the draft document the following general areas:

- Past waste management practices are emphasized, to the exclusion of current efforts, misrepresenting the present situation regarding waste handling;
- The regulatory context for waste management efforts is misrepresented and inaccurately portrayed; the draft report displays poor knowledge of the regulation. In addition, there is careless use throughout the draft report of terminology that has regulatory significance;
- The "Major Findings" are not substantiated within the body of the draft report and lack adequate documentation; in many instances, the "Major Findings" represent conjecture and speculation arising from the limited site visits.
- The Site Descriptions rely heavily on subjective descriptions; there were no sampling programs undertaken or any attempt to quantify or objectively analyze waste management efforts;

Each of these major deficiencies will be described briefly in this Executive Summary. More detailed information will be provided in the text of the attached comments.

Past and Discontinued Waste Management Practices

The Introduction to the draft report states that the "document seeks to provide a description of current waste management practices used on the North Slope and present the major facts and issues relating to these practices". However, the draft report focuses on past and discontinued waste management practices.

For example, almost four pages are devoted to discussing the discharge of reserve pit fluids to the tundra -- a practice that was discontinued in 1987. The draft report spent considerable time reviewing the results of a research project specific to this waste management practice. However, in the EPA's June 29, 1988, Regulatory Determination the following was stated:

> The authors of this study caution, however, that these findings cannot be extrapolated to present-day oil field practices on the North Slope because some industry practices have changed and the State's regulations have become increasingly more stringent since 1983 (emphasis added). [p. 39].

It appears that the draft report, although supposedly in support of the EPA's overall waste management efforts, is attempting to undercut the June 29, 1988, Regulatory Determination issued by the EPA regarding oil and gas exploration and production wastes.

Regulatory Terminology and Regulatory Context

An example regarding the careless use of terminology with regulatory significance is found in the draft report's discussion of subsurface injection of wastes. "Produced water" is described as representing "the largest volume of liquid waste generated on the North Slope". Results are presented for hydrocarbons, suspended solids and total dissolved solids found in produced water. Additionally, the report states "Produced water also contains varying amounts of volatile organic compounds, such as benzene, toluene, and xylene, that are included on the list of toxic priority pollutants contained in Section 307(a)(1) of the Clean Water Act of 1977 (EPA 1987)".

Produced water used for enhanced oil recovery is an in-process fluid, not a waste. Again referencing the EPA's June 29, 1988, Regulatory Determination:

> The Agency has determined that produced water injected for enhanced recovery is not a waste for purposes of RCRA regulation and therefore is not subject to control under RCRA Subtitle C or RCRA Subtitle D. Produced water used in enhanced recovery is beneficially recycled and is an integral part of some crude oil and natural gas production processes (emphasis added). [p. 28].

This would appear to be another instance where the draft report not only is inconsistent with EPA's Regulatory Determination, but appears to be attempting to undercut the Determination.

Regarding regulatory context, the draft report fails to consider several major regulatory programs with substantial control over North Slope oil and gas waste management operations. Foremost among these are the State's Coastal Zone Consistency regulations that are applicable on the North Slope. Permits must be found to be consistent with the policies and conditions of Alaska Coastal Management Program and the North Slope Borough Coastal Management Program before they can be issued. In addition, stipulations or conditions can be placed on a permit through this process before a permit is found to be consistent. The draft report also fails to describe adequately the State's revised Solid Waste Management Regulations promulgated in September 1987, that regulate the disposal of drilling muds and cuttings.

The draft report does not accurately portray the complexity of the regulatory arena regarding North Slope oil and gas projects. The Corps of Engineers' Section 404 program is described, but the draft report fails to consider the requirements for the State's Section 401 Water Quality Certification on this permit and the consolidated State review (involving several State agencies) for coastal zone management consistency. The draft report also fails to consider the North Slope Borough's Land Management Regulations and permitting requirements.

Major Findings

One of the "Major Findings" of the draft report is that ADEC lacks "the authority to issue fines or shut in production for violations of State regulations or lack of response to Notices of Violation". To the contrary however, ADEC has wide reaching enforcement powers. It can issue compliance orders which impose penalities on persons who it determines have violated its regulations. Civil and criminal penalties for pollution damage are set forth in Alaska's statutes. A.S. 46.03.760 and .790. An injunction remedy is also set forth. A.S. 46.03.765.

If ADEC determines that a person is responsible for an actual or threatened violation of an environmental regulation, ADEC has the power to issue a notice, ordering the person to report how he intends to control or prevent the violation and setting forth the penalties to which the person is exposed. The notice can set forth a short deadline for the person to respond to. After ADEC has reviewed the response or the deadline has expired, ADEC can issue a compliance order. The compliance order is immediately effective, unless the respondent requests a hearing.

ADEC also has emergency power to issue an order, without prior hearing, to discontinue an activity which it deems to present an "imminent or present danger to the health or welfare" of the State. A.S. 46.03.820. In addition, it can issue an order, without prior hearing, "to take action the department believes necessary," whenever it determines that there is an imminent threat to public health from an actual or imminent discharge of oil or hazardous substance. A.S. 46.03.865.

Site Descriptions

There are numerous problems in the draft report arising from the subjective nature of the "Site Descriptions". Examples of these are detailed in the enclosed comments.

SUMMARY

In summary, the draft report cannot be viewed as a factual document accurately representing current waste management practices on the North Slope. It is a subjective and misleading portrayal depicting largely past and discontinued waste management practices and in many instances is inconsistent with statements made in EPA's June 29, 1988, Regulatory Determination regarding oil and gas exploration and production wastes.

As stated in the determination:

> Recently, the State of Alaska has improved waste management regulations pertaining to the North Slope. In addition, some operators plan to implement more desirable waste management practices, including the possibility of phasing out reserve pits through the use of closed drilling systems and injection for waste drilling muds and cuttings. If implemented, these changes would be major improvements in waste management practices on the North Slope [p. 39].

This depiction is not consistent with what is portrayed in the draft report.

SUPPLEMENTAL NOTE

POLAR BEARS

Although the draft EPA report does not contain any reference to an incident involving the death of a polar bear, the New York Times account mentions it and wrongly implies that it was a consequence of oil field activities. Therefore, this incident will be discussed here briefly.

In April 1988, the remains of a dead polar bear were discovered by US Fish and Wildlife Service researchers on Leavitt Island, which lies north of the Kuparuk oil field. The remains were stained with a dye which analysis determined to be rhodamine-B. Because rhodamine-B has a very low degree of toxicity, it seemed unlikely that the dye had caused the mortality. Further study established that there was a relatively high concentration of ethylene glycol (a common anti-freeze) in the soil under the bear. Ethylene glycol has a sweet taste that many animals find attractive, and it is also toxic. Thus, the Fish and Wildlife Service concluded that the bear probably ingested a mixture of ethylene glycol and rhodamine-B dye, with death resulting from the glycol.

The next question was to determine where the bear might have found and consumed a mixture of ethylene glycol and rhodamine-B dye. A thorough investigation determined that BP Exploration did not use or have rhodamine-B in its inventory. ARCO Alaska does, however, use rhodamine-B in a water solution to mark the center line of its aircraft runway at Kuparuk and Prudhoe Bay. The water dye solution is mixed just prior to each application, and is not stored. Nor does ARCO ever mix rhodamine-B with ethylene glycol. Through the Support Industry Alliance, an organization of the contracting firms that provide services in the North Slope oil fields, it was determined that none of its members used a mixture of ethylene glycol and rhodamine-B.

Where the bear encountered the ethylene glycol/rhodamine-B solution cannot be determined with certainty. Because of the toxicity of the glycol, it is unlikely that the bear traveled far or long from the place where it consumed the mixture. Because polar bears feed mainly on seals and beach cast marine mammal remains, they spend nearly all of their time on the sea ice or along the coast; it is very rare for polar bears to be seen inland, near oil field facilities. Although the source of the ethylene glycol/rhodamine-B mixture that the bear consumed is unknown, it is clear that it was not from an oil field operation.

Literature Cited

Amstrup, S. C., C. Gardner, K. C. Myers, and F. W. Oehme. Ethylene glycol (antifreeze) poisoning in a free-ranging polar bear. In Press. Journal of Veterinary and Human Toxicology.

COMMENTS ON INTRODUCTION

Documentation

The report is replete with information, observations and comment from unnamed agency and industry personnel. Such information sources need to be identified to ensure credibility and veracity of the information provided.

Further, when statements are made, appropriate documented information should be discussed to confirm the facts in the same portion of the text.

Subjective Observation

The site visit descriptions remains to a large extent a collection of subjective observations and conclusions without the benefit of the technical context or backup to explain those observations.

Failure to Account for Current Management Practices

This draft does to some extent describe current waste management practices and the evaluation of petroleum technology on the North Slope. However, such materials are de-emphasized reflecting a bias of the authors. Specific examples include:

- Use of solids handling equipment for workover operations to separate solids from liquids so that the liquids can be injected in Class II wells
- Use of liners in all BP Exploration pigging pits
- Use of high-speed centrifuges to dewater pigging wastes to facilitate injection of the liquids

- Testing of new technology for grinding drill cuttings for subsequent injection

- Compaction of gravel and inclusion of silt for dike construction

REGULATORY CONTEXT

The EPA Staff Draft Report states that "ADEC does not have the authority to issue fines or shut down production for non-compliance with State environmental regulations." The footnote to this statement references a 1983 ADEC report. This is an outdated reference. According to Alaska Statute A.S. 46.03.760 and 46.03.790, ADEC has had the authority since 1984 to levy fines and recommend civil and criminal penalties for "any adverse environmental effects caused by a violation."

EPA refers to Class II wells as those used by the oil and gas industry to inject produced water for enhanced oil recovery "and the disposal of industrial wastes exempt from regulation under RCRA Subtitle C." Fluids that can be injected into Class II wells are not defined under RCRA, but under the Safe Drinking Water Act, which defines Class II fluids as fluids "which are brought to the surface in connection with natural gas storage operations or conventional oil or natural gas production and may be comingled with wastewaters from gas plants which are an integral part of production operations" and "for enhanced recovery of oil or natural gas."

The Alaska Oil and Gas Conservation Commission (AOGCC) has primacy for the Class II well program in the State of Alaska. The memorandum of understanding between AOGCC and EPA allowing AOGCC primacy has a broad section on comingling waste in Class II wells. The clause states "Class II wells include wells which inject drilling muds or drilling fluids for the purpose of disposal. Other fluids may be comingled in Class II wells and such wells remain classified as Class II wells unless the other fluids are hazardous waste." The Director of the State UIC (Underground Injection Control) program has the authority to clarify which fluids are acceptable for Class II well disposal. The Director makes this determination on a case-by-case basis.

The description in the draft report of the Corps' regulatory authority is not completely accurate. Onshore, the Corps' Section 404 authority extends to the placement of gravel fill, not the facilities placed on the fill. Offshore, the construction of such structures as gravel islands and causeways are also regulated by the Corps under Section 10 of the Rivers and Harbors Act relating to the installation of structures in navigable waters.

In the context of oil and gas development, the Alaska Department of Fish and Game's (ADFG) regulatory responsibility specifically relates to activities in anadromous fish streams for which it issues permits under Title 16 of the Alaska Statutes. ADFG also conducts review and provides comment on various state permits and authorizations.

SUBSURFACE INJECTION OF WASTE

This section fails to describe the geologic context of subsurface injection on the North Slope which is important to understand the potential environmental effects of such waste disposal. There is an absence of an underground source of drinking water within the Prudhoe Bay Unit. Because of the high dissolved solids content, the area beneath the permafrost has been exempted by EPA as an underground source of drinking water. Two thousand feet of permafrost and confining layers of shale prevent vertical migration of wastes injected into the so called "shallow zones."

SURFACE DISCHARGE TO THE TUNDRA

The discussion of surface disposal of wastewaters should differentiate between present and past practices. This section does not distinguish between practices which are currently utilized and practices which are no longer employed.

The following disposal options are examples of past practices:

- Discharge of reserve pit fluids to tundra
- Surface oiling
- Disposal of reserve pit fluids to roads
- Discharge of hydrostatic testing fluids to tundra
- Excavation dewatering

In the past, these activities were conducted and regulated under State permits. Domestic wastewater discharges are regulated by NPDES permits issued by the EPA.

Discharge of Reserve Pit Fluids to Tundra

This section should clearly address and recognize present practices adopted for management of reserve pit solid wastes. BP Exploration has placed impermeable liners in many reserve pit embankments where past seepage has been identified. Liners will be installed at additional sites in 1989. A program has been undertaken to manage the fluids in reserve pits--these fluids are being injected underground in acceptable formations. The reserve pits do not receive produced water, truck rinsates, or spill materials as indicated in the EPA report.

The new state solid waste management regulations do not require a full liner for new reserve pits. One containment option is a below grade reserve pit with permanent containment by freezeback.

The study by the USFWS-Battelle has many inaccuracies and difficulties in study design. A recent study, in which EPA is a participant, was undertaken to address many of the issues raised in the USFWS article. The study conducted during the summer of 1988 resulted in a draft report titled, "Bioaccumulation of Heavy Metals, Salts and Hydrocarbons in Lower-Trophic Levels in the Prudhoe Bay and Kuparuk Fields." This draft study was distributed for review in January. The major findings from this draft report are that aquatic invertebrates and vascular plants did not demonstrate increased uptake of heavy metals, salts, or hydrocarbons, although there appears to be some uptake of metals occurring in phytoplankton. There are significantly higher concentrations of salts adjacent to reserve pits as compared to control sites. This results in greater solubility of metals near reserve pits, but does not appear to contribute to increased mortality due to bioaccumulation or toxicity of metal ions.

OPERATORS

The draft report incorrectly states that Texaco and Amoco "have production facilities located immediately offshore from the Prudhoe Bay production area." Neither of these companies has or is currently operating oil production facilities on the North Slope of Alaska.

MAJOR FINDINGS

ARCO Alaska

SITE #6 Prudhoe Bay Unit Pad 3 Oily Waste Disposal Facility

EPA points out that chemical analysis is not performed on incoming sludges. They are exempt waste under the oil and gas regulations. These "sludges" are collected in the pit and the pit is dewatered after spring thaw.

The report discusses cracks at the edge of the pit where the liner is exposed. One cannot infer that because there are cracks in an exposed edge of the liner that cracks exist in the covered protected portions of the liner. This pit is required to be permitted under the Alaska Solid Waste Management regulations which require active monitoring around the pit for the detection of any leachate from the pit.

The report cites oil stains that were observed at the facility during the agency tour and goes on to imply that snow removal activity is dumping oily gravel on to the tundra. Pads are monitored periodically for oil stains and spills and any contaminated material is removed to the oily waste pit as it is discovered. Oil-stained gravel is not deposited on the tundra.

The report cites EPA concern regarding H_2S detection at the facility. H_2S detection was not deemed to be necessary at the Pad 3 facility until recently because H_2S levels could not be detected. H_2S levels in the field have only recently been evident as the field ages and production of water from the reservoir has increased.

The EPA report discusses alleged problems at the Pad 3 facility as enumerated by the Trustees for Alaska and a disgruntled ex-ARCO employee. ARCO has prepared a detailed rebuttal to these allegations which discount these concerns. EPA should review ARCO's response to the allegations before stating them as relevant concerns in their report.

SITE #3 ARCO Abandoned Mine Site

Sag River Mine Site C is one of eleven gravel mine sites which have been flooded to date. These artificial lakes provide water for industrial and domestic uses and appear to have created additional overwintering habitat for several species of anadromous and fresh water fish. The volume of this overwintering habitat is considered to be a primary limiting resource for arctic anadromous fish species and may place a cap on population sizes (Craig 1988, Schmidt et al. 1987). Therefore, creation of suitable overwintering habitat may provide an important resource for some fresh water and anadromous fish.

The Alaska Department of Fish and Game (ADFG) has studied these flooded mine sites since 1986. They have observed that "favorable dissolved oxygen levels exist throughout the winter season in these gravel pits (Hemming 1987a, Garlasco 1987)" (ADF&G 1988), and that these pits have the potential to support fish populations during the approximate 9 month winter on the North Slope of Alaska. Additionally, the studies by ADFG have determined that:

> Evidence has been gathered that phytoplankton standing crops are comparable with natural waterbodies, and plankton tows indicate fair concentrations of copepods and cladocerans [important prey species for fish]. Fish condition [the relative "fatness" of the fish] has been subjectively determined as excellent and the majority of fish stomachs (e.g., broad whitefish and Arctic grayling) sampled have contained food items. All data gathered to date indicate that both rearing and overwintering fish are present in these partially rehabilitated mine sites. Five sites have been sampled and all have been colonized with two or more fish species. ... It appears that with proper site rehabilitation, enhancement of these large waterbodies could significantly increase the fish carrying capacity of the local waters with direct beneficial effects on local fish populations.

BP Exploration is providing funding and logistical support for studies of these overwintering habitats by ADFG. Field studies for 1989 are expected to include research on the physical and biological factors which mediate fish productivity of the sites and on techniques which may enhance that productivity. BP Exploration will continue to support research projects, such as the mine site rehabilitation studies conducted by ADFG, to develop practical methods for reclamation and rehabilitation of tundra sites disturbed by oil and gas development.

Literature Cited

ADFG (Alaska Department of Fish and Game). 1988. Fisheries enhancement evaluation of flooded gravel mine sites within the North Slope oilfields. A proposal to Standard Alaska Production Co. 20 pp.

Craig, P. C. 1988. An introduction to anadromous fishes in the Alaskan arctic. Biological Papers of the University of Alaska. 24:27-54.

Schmidt, D. R., W. B. Griffiths, and L. R. Martin. 1987. Importance of anadromous fish overwintering habitat in the Sagavanirktok River delta, Alaska. Prepared for Standard Alaska Production Company and the North Slope Borough. 71 pp.

BP Exploration

SITE #1 Standard's Hazardous Waste Storage Site

The location of the hazardous waste storage site is stated as being "on C Pad in the Western Operating Area". This would lead to confuse someone not familiar with the facilities, to think that the C Pad production facilities and hazardous waste storage site were one and the same. In fact, the C Pad Hazardous Waste Storage Site is a physically separate facility.

In Paragraph 2, the report claims that the overpack drums at BP Exploration's C Pad hazardous waste storage facility are stacked two (2) high. The overpacks that are double-stacked are empties stored for future use. It is implied that no recordkeeping is performed and that there is no planned removal of wastes for disposal. In fact, detailed records are kept of all waste material processing and wastes stored for recycling, reuse or disposal. Periodic disposal shipments have been made to Rollins Hazardous Waste Disposal incinerator facility in Deerpark, Texas, including shipments in March, 1987 and October of 1988. Additionally, as appropriate for the designated waste streams, other permitted recycling facilities are used, especially for waste oil (used specification fuels). In addition, proper recycling of products is encouraged throughout the field. Specific examples from 1988 include the surplusing of paint and caulking compounds and the recycling of Part A and B components of insulating products. These activities are documented in the facility records as well as on annual hazardous waste management reports provided to ADEC in accordance with their regulatory hazardous waste program. In addition, reports of the hazardous waste generation and management have been provided to EPA in accordance with RCRA regulations.

BP Exploration (as Sohio) was granted interim status for the C Pad hazardous waste storage facility by EPA Region X on November 30, 1982. On August 11, 1980, BP Exploration (as Sohio) submitted a generator notification to EPA as required by the RCRA regulations (40 CFR 270). BP Exploration is allowed to store wastes for more than 90 days before shipping them for disposal because the C Pad facility is an interim-status RCRA hazardous waste storage facility. On November 4th, 1988 BP Exploration (as SAPC) submitted a RCRA Part B Application for the C Pad RCRA Storage facility in accordance with the 1984 HSWA amendments to RCRA and subsequent regulatory changes.

In response to comments provided last fall on the Versar report, this draft report correctly identifies that appropriate chemical monitoring of wastes oils is carried out. In addition, it cites the recycling activities with Chevron, which is the current contractor in Alaska which is recycling waste oil into boiler fuel in accordance with ADEC and EPA regulations. Chevron has been inspected by EPA and the Alaska Department of Environmental Conservation and has declared its activity as a waste oil marketer to EPA.

The very last sentence cites ADEC as stating that the area around the waste oil tank has been used for disposing of incinerator ash. As cited in the SAPC authored Prudhoe Bay Unit Western Operating Area Corrective Action Report EPA RCRA ID No. AKD000643239 a solid waste disposal facility cell was located in the C Pad RCRA interim status storage facility pad. However, the cell was for the natural gas flare which burned putrescible and combustible wastes under burning and solid waste permits from ADEC rather than the disposal of incinerator ash.

SITE #4 Standard's BOC Camp Sewage Treatment Plant

The report incorporated detailed information provided last fall on the draft Versar report. However, the paragraph states that there are only two NPDES permits in the Prudhoe Bay oil production area for the discharge of treated sewage. This is not correct, as several drilling rigs in use on the slope have obtained or are in the process of obtaining NPDES permits for their camp sewage treatment units and discharges. Additionally, the NPDES permit for Endicott includes up to three discharges from sewage treatment facilities (the production plant and 2 drilling rig camps).

SITE #5 Standard's Y Pad Drill Site

The 1988 applications for Solid Waste Management permits formulated by the ADEC for the existing reserve pits (like those in the Prudhoe Bay Unit) included requests for information on waste volume for disposal, but had no requirement for listing the type of waste. 1988 Solid Waste Management applications differed from previous forms required for the new reserve pits at W Pad and Z Pad. At the W Pad and Z Pad, detailed information on the solid waste type for disposal at the site was required. The only Solid Waste Management permits under the revised ADEC regulations issued to date in the Prudhoe Bay Unit are for W Pad and Z Pad reserve pits.

The discussion of the Notice of Violation at the W Pad is incorrect. There was an accidental release of oil based muds and cuttings to the W Pad reserve pit which was promptly removed and disposed of at a permitted oily waste facility.

The statement in the draft report that the discharge of any workover waste or oil-based drilling fluids has been and is currently a violation of all past and current reserve pit permits issued by ADEC to BP Exploration is incorrect. ADEC has issued only two permits to BP Exploration--W and Z Pad Reserve pit Solid Waste Management permits. The permits for the other reserve pits in the Western Operating Area of the Prudhoe Bay Unit are still pending ADEC approval.

SITE # 6 East Dock

Addressed in the VERSAR report is an August 28, 1984 ADEC letter to BP Exploration which highlights permit compliance concerns. However, the followup discussions and meetings between BP Exploration and ADEC in Fairbanks and information exchanges between BP Exploration and ADEC are not presented.

The East Dock three-celled reserve pit was constructed in 1980 and was used for disposal of muds and cuttings during the 1981 and 1982 drilling seasons only. Concerning other uses of the pits: In 1983, as an emergency measure, melt-water was placed in one of the East Dock reserve pit cells from another onshore exploration reserve pit that was full. Additionally, two of the reserve pit cells were used in spill response testing in 1983 and 1984 as part of the Tier II Program in which ADEC was a major participant. Approvals for use of these pits for the Tier II testing was received from both the COE and the State of Alaska.

The Corps of Engineers permit for the East Dock sump five year monitoring program required that annual reports be submitted to the District Engineer and made available for review by Federal and State agencies when requested. ADEC was put on the BP Exploration distribution list immediately after they requested copies of the annual reports.

There were no State or Federal permit stipulations that required BP Exploration to fill in the East Dock sump after the permitted use expired. After ADEC requested BP Exploration to close-out the East Dock sumps in 1984, negotiations began immediately with ADEC concerning a number of different close-out and revegetation options. Final approval on one of these close-out plans was received from ADEC August 7, 1987. Gravel was placed in the two mud-containing sumps in late August 1987, and sampling monitors and thermistors were installed and measurements were taken. The

overburden work on East Dock was completed by late July 1988 and was followed by hydroseeding in early August 1988. A report of the results for the 1987 water quality sampling and the 1987 and 1988 thermistor measurements was sent to ADEC.

In response to the statement that revegetation has not been tried on a large scale, and that methods and technology for large-scale revegetation is unproven: Comments were provided in earlier drafts on this issue. Revegetation work has been completed successfully on oil-spill sites, and on drill pads, access roads, material sites, disposal sites, and other gravel structures in the NPRA, PBU and TAPS, and research and test cases, such as East Dock, are ongoing on the North Slope.

SITE #7 Standard's G Pad

The report failed to account for current management practices. BP Exploration no longer uses reserve pits for disposal of oily workover wastes, which are now either disposed of in Class II injection wells or are recycled through the production process. BP Exploration now removes all fluids from reserve pits as soon as spring thaw occurs and disposes of these fluids by injection.

SITE # 8 Standard's J Pad

The report fails to account for current management practices. BP Exploration no longer uses reserve pits for disposal of oily workover wastes, which are now either disposed of in approved Class II injection wells or are recycled through the production process.

BP Exploration does not and has not discharged oil spill cleanup materials in flare pits, and this is not considered an option.

Most oil spills occur on ice and snow. The material can be cleaned up, melted, and separated. The oil component is recycled into the oil stream and the water is injected into an approved disposal well. Non-liquid oily waste material is disposed of at the Pad 3 facility which is fully lined.

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SITE #9 Standard's Endicott Production Facility

The Endicott facility causeway is approximately 5 miles long in total length, however, it only extends about 2 miles offshore of the Saganavartok River.

In paragraph 2 of page 55 it is stated that the permitted discharges "... are discharged directly into the Arctic Ocean". The very next, and concluding sentence of the paragraph states "The area is a feeding ground for arctic aquatic life in the summer." This is very misleading. First, this area is not a restricted or special feeding ground, and second, there is no mention of the extensive monitoring programs which are conducted for the Endicott Development under two separate permits: the Environmental Protection Agency NPDES permit for discharges from the production facilities and the U.S. Army Corps of Engineers permit for the causeway and gravel islands.

The NPDES permit regulates drilling effluents, seawater treatment plant effluents, drinking water, and sewage treatment plant discharges. The permit requires a detailed monitoring program for drilling fluid and cuttings disposal which includes monitoring of all components and additives, their concentrations, their toxicity, and the character of the effluent. The permit also requires regulation and/or treatment of the drilling effluents to meet the effluent criteria <u>prior</u> to discharge. The monitoring studies have been underway since 1982. Additionally, bioassays for toxicity are performed on the mud types and on mud samples from wells. The monitoring program has detected <u>no</u> impact on the fish or benthic biota.

North Slope Borough Facilities

SITE #1 Oxbow Landfill

The opening paragraph implies that all industrial waste that is not recycled or injected on the North Slope is disposed of at the Oxbow Landfill. This is not accurate in that hazardous wastes and some industrial wastes are shipped outside for disposal. In addition, the North Slope Borough, in conjunction with their permit monitor the materials into the landfill and do not allow any chemicals, drums which have not been triple rinsed and crushed, and other restrictions apply.

The oily waste pit has been operating under an Alaska Department of Environmental Conservation permit since 1981. The permit was reissued on March 3, 1987 (Permit No. 8636-BA023).

The volumes being received by the NSB have increased with the recent and significant changes in the oil industry's waste management practice changes. However, the disposal of 72,000 cu. yards in May and June 1988 was the result of a change-out program and is not anticipated as an ongoing yearly generation.

Although it is not possible to prove in retrospect, we believe the reported arsenic levels are incorrect. In the results reported for the discharges to the tundra in 1985, it is possible that the arsenic levels reported could be inaccurate if the test criteria did not account for salt interference. This type of analytical error has occurred frequently in various analyses in conjunction with drilling fluids and other North Slope discharges. The claim in the second paragraph on page 16 that water from the landfill could be carrying contaminants to the Put River is unfounded. Since the

level of the river is significantly higher than the level of the water in the landfill, such migration of contaminates is not possible. As noted in the draft report, 1985 was the last year that this surface discharge occurred.

Regarding the rinsing of drums, regardless of ADEC regulatory stipulations, the NSB has requested in writing that the drums be triple rinsed. The point is that all drums must be cleaned prior to disposal, and the draft report should not dwell on minor, insignificant differences in the way the stipulation is carried out.

Substantial commentary is provided on the various comments received by the ADEC on the North Slope Borough's application for the expansion of the oily waste facility. The procedures for processing permits and evaluating and responding to comments are set forth in State permit procedures. The permit application should not be short-circuited by inappropriate and unsubstantiated discussion of the information regarding the various comments on the permit.

Service Companies - Deadhorse

SITE #6 North Slope Salvage, Inc. (NSSI) Site

The continual reference to this site is a prime example of the use of past incidents to mislead readers about current operations. The cleanup was completed and initially financed by the Prudhoe Bay operators, BP Exploration and ARCO. However, since this incident and the subsequent cleanup occurred more than 5 years ago, it is not a reflection of current operations. NSSI has not re-established any operations in Deadhorse. Deadhorse operators through the Alliance, an industry support organization and the oil industry have all been working together to identify and cleanup problem areas and to implement practices for proper recycling and disposal. These steps will ensure that a similar situation will not occur.

SITE # 7 Child's Pad

We agree that both ARCO and BP Exploration (SAPC) voluntarily went to the State to help initiate site cleanup at Child's Pad, a service contractor pad in Deadhorse where abandoned solid waste had been accumulating. However, the report does not mention the facts that neither BP Exploration or ARCO had control over the site nor was responsible for abandoning any of the material on the site. ARCO and BP Exploration made an agreement with the State to remove the solid waste to the North Slope Borough Landfill, collect any abandoned drummed material in a lined containment area, and sample the gravel pad to determine the extent of any contamination. That remedial program is in progress. It is anticipated that the remaining cleanup will be completed in 1989 pending agency concurrence of the plans.

SITE #11 VECO Oil Field Service Company

The draft site visit report prepared by EPA contains a brief description of the pad and facilities occupied by VECO, Inc. in Deadhorse. VECO is a major oil field service company and operates facilities for vehicle maintenance, electrical supply, concrete batch mixing, and wood and steel fabrication. It is important to note that, at the time of the visit by EPA, VECO had recently moved to a new site in Deadhorse and was in the process of decommissioning some of their former facilities. Decommissioning activities included demolition of old structures and cleanup of debris on and near the pad. These activities should be viewed as a positive step in that facilities were not abandoned, but were being cleaned up in a responsible manner by VECO.

EPA described an incident on the VECO pad involving burial of approximately 50 gallons of paint. According to records supplied by VECO, workers placed the paint, without authorization, in a test bore hole located on the pad. As soon as these activities were noticed, the paint was excavated and the incident was reported to ADEC. The actions by ADEC resulted from reports filed by VECO. The cleanup and response by VECO were considered to be complete and satisfactory by ADEC.

According to the EPA report, there was a large number of empty drums stored at the VECO site. Information provided by VECO indicates that all drums on site contained new products that were being stored for future use. Additionally, a hazardous waste determination had been conducted during April 1988 which identified the type and quantity of all materials used and the wastes generated by all of VECO's operations at Deadhorse. The EPA report failed to note this important fact and therefore presented an unsubstantiated and inaccurate conclusion regarding waste generation and storage at the VECO site.

In August 1988, the diesel storage tanks referenced in the EPA report were drained and removed from use. All contaminated gravel from the site was removed and disposed under the direction of ADEC. By September 1, 1988, the entire site had been cleaned.

The EPA site report contains a number of descriptions of past actions by VECO that had been corrected or were being corrected at the time of the EPA visit. As is evident throughout the EPA report, there is an almost complete reliance on the subjective opinion of the observer and a lack of scientific documentation of supposed impacts related to improper waste handling or disposal. The examples of improper waste management at the VECO site are actually past practices or inaccurate representations of current practices. The descriptions of the VECO site in the EPA report are not indicative of existing conditions and do not accurately represent conditions at the time of the EPA visit.

INTRODUCTION

ARCO Alaska, Inc. ("ARCO") obtained a copy of a document entitled "Draft; Site Assessments - North Slope Alaska" prepared by VERSAR, Inc., a contractor apparently assigned by EPA to collect information on exempt exploration and production waste handling practices. We understand VERSAR's report is to be used as support for EPA rulemaking activity pursuant to Section 8002(m) of RCRA. The draft report details the visit of two VERSAR employees who visited the North Slope oilfields during a three day period in June 1988. ARCO accommodated the requested visit and supplied employees to conduct the EPA contractors to requested locations. Employees were also made available to discuss waste handling practices. Unaccountably, the report is filled with serious mistakes of fact, garbled or out of context statements and incorrect or subjectively biased characterizations of waste handling practices. We believe that the report should be withdrawn, more complete, accurate information collected, and the report rewritten.

ARCO has conducted a cursory review of the report and described in the following pages the most obvious errors in the draft report. We understand that Standard Alaska and the various service contractors mentioned in the report will also be responding to the draft report.

ARCO's preliminary review has revealed a number of categories of deficiencies in the report:

- waste practices criticized as "poor" are either not now being conducted or occur only in exceptional or transient circumstances. For example, contrary to allegations in the report, oily wastes are <u>not</u> dumped into flare pits or reserve pits, sheens on reserve pits are infrequent; "unknown" wastes are not disposed of; general debris is <u>not</u> placed into former gravel pits.

- errors in technical detail abound--despite briefings provided by ARCO field personnel. For example, in Kuparuk, misstatements are made as to well depths, well workover frequency and waste quantities, pigging practices, facility configuration, and many other details.

- errors are made as to the applicability, existence or content of State and federal regulations affecting disposal practices.

- the reviewers clearly lack integrated knowledge of field operations and waste disposal practices; combined with the fact that the visit was conducted during breakup, one

wonders whether the report's judgments were unduly colored by visiting during this naturally sloppy season.

At the time of the site visit, VERSAR staff indicated that the purpose of their tour was to gather information to evaluate waste management practices associated with oil and gas exploration and production activities. The tour was obviously too brief (approximately a half day devoted to each unit) to give even a rudimentary understanding of the field or to allow an adequate transfer of information on North Slope waste handling practices. The numerous factual inaccuracies confirm this view; individual errors may not be important but collectively they are crucial to the value of the overall report and question its merit.

Because of the number of mistaken facts the report needs major revision or re-writing. Further, in our view, VERSAR staff should re-visit the North Slope facilities and re-work their report in conjunction with the Alaska Department of Environmental Conservation (ADEC), the Alaska Oil & Gas Conservation Commission (AOGCC), the North Slope Borough, the North Slope field operators, and the Deadhorse service community. This would produce a finished report which would be accurate and consequently valuable. As is obvious, the economic consequences of relying on an inaccurate or biased report are momentous.

In addition to the factual inaccuracies, there are several statements made in the report which indicate that the VERSAR authors may lack a fundamental understanding of existing regulations. This is evidenced by the statements regarding Drum Disposal Guidelines (40 CFR 261.7) as well as EPA's SPCC regulations. It is also apparent from the report that the VERSAR staff were unaware that jurisdiction over Class II injection wells has been delegated by EPA to AOGCC.

The subjective nature of the narrative is not consistent with a factual representation of North Slope waste handling activities. We believe that the the tone of the report reflects an apparent bias. There are numerous statements which are not only inaccurate, but misleading in context. Areas are rated according to a housekeeping scale with no explanation of the rating criteria. Phrases such as "unknown wastes" indicate (inaccurately) that the unit operators do not know the origin or composition of particular wastes.

There are other statements, such as the description of waste handling practices at Kuparuk mine sites, which may to be quite misleading to an unfamiliar reader. The statement begins by describing ancillary debris brought in with pad snow removal activities and then quickly transitions to oil spill removal activities thereby implying that materials from oil spill clean-ups are stored at mine sites.

The statement is made "that no waste manifest system is used" at the Kuparuk Oily Waste Injection Facility and the Kuparuk Recycling Center. An extensive manifest system exists at both facilities. ARCO was not requested to provide information about this system.

Another problem is the use of incorrect information which is extrapolated to produce unrealistic estimates of large volumes of produced wastes. For example, the incorrect reference to "2 to 3 workovers per day" leads the authors to conclude that more than 300 times the actual volume of workover wastes are produced.

The site visit occurred in June during the spring thaw period known as "break-up." Break-up is a turbulent transition period which lasts approximately one month. This period is characterized by large volumes of snowmelt including sheet-flow of water and is not typical of the normal appearance of the area. At that time of year, all tundra vegetation is still brown from winter kill; it would be very difficult to visibly discern any particular area of tundra was dead. Any trash or debris which has inadvertently become frozen in the snow during winter is visible. Each year worker are employed to pick up trash and debris from the field.

The following comments relate to specific pages of the report.

Executive Summary

Paragraph 2

". . . dumping of oily wastes into unlined flare pits and pigging pits."

ARCO Alaska, Inc. does not dump any oily wastes into unlined flare pits or pigging pits. If pumpable, oily wastes are injected into properly permitted Class II injection wells. During normal flaring operations liquid hydrocarbons are occasionally carried through the flare system and burned off. Pigging pits located at the drillsites are typically lined for emergency relief. Routine pigging of water injection lines occurs but these lines do not contain any hydrocarbons.

Paragraph 2

"dumping of oily wastes into reserve pits."

ARCO does not dispose of oily wastes into reserve pits. In prior years, a central disposal pit was used. However, Kuparuk discontinued disposal of any oily wastes to a single central disposal Pit two years ago. This pit was closed out pursuant to an ADEC

agreement during the summer of 1987. Prudhoe disposes of solid oily wastes into a lined pit at Pad 3, permitted by ADEC.

Paragraph 2

". . . disposing of oily waste, unknown wastes, and general debris into former gravel pits."

This statement is incorrect. Mine site E has been used as a temporary central collection area for winter snow removal from pads. Although a stringent policy against littering and disposal of wastes exists, occasionally some litter is accidentally picked up during snow removal operations. The central depository provides a confined location in which any excess debris may be collected after breakup for disposal at the North Slope Borough landfill. The North Slope Borough landfill is located in an area which was formerly a mine site, but the facility is presently permitted as a municipal landfill and solid waste disposal site by ADEC.

Paragraph 3

". . . Practice of injecting wastes in Class II wells is desirable. . . . the performance and integrity of some Class II wells . . . are questionable."

This statement is apparently based on conversations with ADEC officials accompanying the auditors. UIC Class II injection wells are regulated by the AOGCC, not the ADEC. Mechanical integrity tests are routinely performed on Class II wells as required by AOGCC UIC Regulations. We are unaware of AOGCC concerns regarding the performance or mechanical integrity of any Class II wells.

Paragraph 5

". . . Wastes generated by service companies are disposed of on the tundra."

There are no operating practices of which we are aware that would sanction disposal of wastes on the tundra.

New ARCO Drillsite

Page 1

"drilled to depth of approximately 10,000 ft."

- Kuparuk wells are only drilled to about 6,500 vertical depth.

- Discussion of a heavy rig causing damage to gravel road has questionable relevance to a waste report.

Page 1, Paragraph 3

"workover and completion wastes typically contain acids, caustics paraffin breakers (such as the solvent xylene), gels, corrosion inhibitors and a host of other compounds."

This statement is inaccurate. The above-mentioned materials are not used during workover and completion operations. These materials are commonly used in the treatment of wells, flowlines and facilities. Once used, the material is exempt under RCRA. All RCRA exempt fluids are disposed of at an approved facility.

Page 1, Paragraph 4

Statements concerning workovers are inaccurate.

1) There are approximately 600 wells in the field

2) In 1988 only 33 workovers were performed, with only one workover rig in operation doing both well workover and new well completions.

The statement of 2 to 3 workovers per day implies that 730 to 1,095 workovers are performed each year, 1.5 to 2 times the number of wells in the field.

The estimated volume of workover waste of 500,000 BBL is grossly overstated. A typical Kuparuk workover generates approximately 300 BBL of fluid, of which 250 BBL are recycled and used again. This would produce only 50 BBL of waste per workover, or 1,650 BBL of waste annually, not 500,000 BBL.

Page 2, Paragraph 2

Pigging operations are incorrectly described. The only pipelines in Kuparuk which are routinely pigged are the water injection lines. Oil production lines are not pigged. Since the water injection lines are the only lines pigged, paraffin could not accumulate since it is associated with oil production.

"At the location in the pipeline where the pig is removed, a pit is dug and the sludges are dumped into the pit."

The statement, as well as the rest of this paragraph, is inaccurate. At most drillsite facilities with ongoing waterflood operations, pigging pits are lined containment pits where the fluid is evacuated (typically all water). The water is quickly removed by vacuum trucks upon completion of the pigging

operation. The new drillsites, at which water injection is beginning, have no need for pigging operations. Accordingly, these sites do not have lined pigging pits. These new drillsites with waterflood operations are pigged to the reserve pits from which the water is immediately removed. ARCO is currently working with State and Federal agencies on a plan to close or line all open reserve pits, including those used for pigging. During the winter (9 months) the reserve pit berms are frozen solid, thereby preventing migration of any fluids to the tundra and such pits are drained in the summer season.

ARCO Materials Storage & Drum Disposal

Page 3, Paragraph 1

This paragraph is again incorrect. The drum storage area has lined berms; the liner is covered with a lift of gravel to protect the liner from equipment placing drums in the pit. It is interesting that the report states the berm is constructed of large diameter gravel, implying high potential for migration of containments to the tundra, yet they also observed standing water in the area, indicating in fact that the liners were working.

Page 3, Paragraph 1

"visible signs of physical damage" to the drums if true is irrelevant since the drums are empty and awaiting destruction. Physical damage to the drums would result in no environmental effects.

Page 3, Paragraph 2

This paragraph regarding drum handling is incorrect. Drums are not double rinsed, but double drained. No additional fluids/ materials are used or created as implied in the report.

The statement that wastes from drums is not exempt is incorrect. Drums are emptied as specified in 40 CFR 261.7 (b)(1). EPA's own policy defines a barrel as empty when it contains less than one inch of fluid. To the extent that one inch of fluids is recovered those fluids are excluded from RCRA. These exempt fluids are either reused or disposed of at a State approved facility. Kuparuk drum fluids are not disposed of at Pad 3. Operating procedure prohibits acceptance of any barrels which do not meet the empty criterion.

ARCO Abandoned Mine Site - Kuparuk Field

Page 3, Paragraph 3

"there are no State regulatory siting or reclamation requirements for these pits."

Statements in this paragraph are incorrect. ARCO has permits from the Alaska Department of Natural Resources, Army Corp of Engineers and the North Slope Borough requiring mine site rehabilitation and reclamation. ARCO has begun reclamation of Mine Site F at Kuparuk (as well as the Sag C mine site at Prudhoe Bay.) Additionally, numerous revegetation studies and efforts have been conducted with some encouraging results. ARCO is currently working with the Alaska Department of Fish and Game, not the Fish and Wildlife Service, on mine site rehabilitation options.

Page 3, Last Paragraph

This is another inaccurate statement; as worded, it implies that mine sites are used for garbage and debris disposal, which is not true. By juxtaposing a discussion of oil spills, it further implies that oil spills are placed in the mine sites. This is incorrect. Kuparuk Mine Site E has been used to temporarily stage snow removed from pads during snow removal activities. While much snow is cleared off the pads, snow closest to the pad is taken to the mine site to prevent/minimize any ancillary gravel being pushed off onto the tundra. The snow hauled to the mine site sometimes contains gravel and some occasional debris which may have been buried or covered in the snow. As you are undoubtedly aware, the gravel on the pads originally came from the mine sites. Any debris which finds its way into a mine site with the snow removal is cleaned up as the snow melts and disposed of properly in the North Slope Borough landfill.

Page 4, Paragraph 1

". . . hundreds of spills are reported each year. . ."

In context and without further explanation, this is misleading. On average, approximately 150 spills per year occur in the Kuparuk Field. These reported spills, which are as small as one pint, are immediately cleaned up and reported to the ADEC. Oily waste contamination of a mine site is avoided. If noted, any such contamination is cleaned up and reported as required by State and Federal regulations. The report indicates location, source, time of spill, type of material, estimated volume, containment procedures and remedial cleanup action taken. These reports are available from state and federal agencies.

Page 4, Paragraph 2

ARCO's Oily Waste Injection Facility

A number of inaccuracies appear in this paragraph. Although the statement, ". . . wastes would fail the RCRA ignitability characteristic because of their high petroleum content." may generally be correct, what the report fails to note is that these materials are exempt from RCRA disposal regulations. Moreover, flash points of exempt fluids are occasionally below 140°F.

The statement that no waste manifest system is used at this facility is wrong. All oily waste loads are manifested under the Kuparuk Oily Waste Manifest system which is constantly monitored on a daily basis by on-site personnel. Hard copies of the manifests, as well as computerized logs of manifests, are readily available. To our knowledge, the study team did not request to see or to obtain copies of any manifests.

Comprehensive analyses of injected wastes are not conducted. The wastes are non-hazardous due to source, manifested information, and/or they are exempt from the RCRA disposal regulations.

ARCO's Oily Waste Recycling Center - Kuparuk Field

Page 4, Paragraph 4

". . . sludges are disposed of at the Pad 3 oily waste pit. . ."

No sludge generated at Kuparuk is disposed of at Pad 3; all solids/sludges generated at the Recycle Center are properly disposed of at the North Slope Borough Oxbow landfill.

Page 4, Paragraph 5

The statement, ". .inadequate to contain 110% of the volume. . . as required by Federal SPCC regulations" is incorrect. Federal SPCC regulations in fact require secondary spill containment to be sized to contain 110% of the volume of the largest tank plus precipitation; they do not address manifolded tanks. The secondary containment volume surrounding the 2Z settling tanks is sized to contain 110% of the volume of the manifolded tanks, as required by other permits.

Page 5, Paragraph 1

Hose breakdown spillage is not allowed to drain into surrounding gravel. While no high level alarms exist, the facility is manned 24 hours per day, the tanks are manifolded and secondary containment exists. As with the oily waste facility, all loads brought

into the recycle center are manifested and documented, contrary to statements in the report.

ARCO's Pad 3 Oily Waste Disposal Facility

Page 5

Since 1985, when RCRA Interim Status ended, the Pad 3 facility has accepted only exempt or nonhazardous wastes. The disposal wells have been permitted and are regulated by the Alaska Oil and Gas Conservation Commission to which EPA has delegated Class II UIC regulation authority. The ancillary solids disposal pit, permitted by ADEC, is excavated into the permafrost and is fully lined with a polyurethane fabric liner. Thermistors are located beneath the liner and monitor soil temperature. If the soil is frozen, wastes cannot escape or migrate because of intact underlying permafrost, which is impermeable. Where tears in the fabric have occurred, they have been repaired. Activity at these facilities has occurred pursuant to state permits.

Regarding H_2S levels at the facility, liquids and solids arriving at the Pad 3 facility typically have negligible concentrations of H_2S. However, H_2S detection and warning devices are installed at the facility, contrary to the assertion of the report. Further, personnel have received appropriate H_2S safety training.

Flow Stations - Gathering Centers

Page 8, Paragraph 5

"Precipitates and sludges from collection and separation vessels, otherwise known as tank bottoms, are removed approximately once every two years."

Collection and separation vessel wastes are RCRA exempt and consist mostly of formation sand. Volumes are overstated.

Prudhoe-EOA drillsite test separators have needed cleaning once in eleven years. Slop oil tanks have also required only infrequent cleaning.

Page 8, Paragraph 5

"Corrosion inhibitors and biocides are added to these vessels periodically to prevent corrosion from H_2S and sulfate reducing bacteria."

These chemicals are routinely added to the production fluid streams upstream of the vessels and are soluble in these streams. Hence, they do not build up in the vessel sediments.

Page 8, Paragraph 5

"Metals commonly found include lead and chromium,. . . However, no documented chemical analysis was provided for review."

The statements imply that significant levels of metals are commonly found in flow stations vessels. In fact, measured levels are low--one test in 1987 revealed 1 ppm total chromium and 1 ppm lead. This documentation was available when VERSAR visited, but to our knowledge it was not requested.

Page 9, Paragraph 3

"Dirty Water" tanks are present at these facilities. These tanks relieve flow-back from well stimulation and completion operations."

This statement is inaccurate. No well stimulation or completion fluids are directly flowed back to the dirty water tanks. Well stimulation fluids are comingled with produced fluids in the train separators. Well completion fluids are rarely sent to the flow stations. They are typically filtered and reused. When spent, these fluids are disposed into Pad 3 injection wells or pumped down annuli pursuant to ADEC and AOGCC permits.

North Slope Salvage Site

Page 14, Paragraph 1

VERSAR's description of the NSSI incident implies that ARCO/Standard improperly conducted the cleanup activity. Cleanup was in fact conducted under the guidance of ADEC and EPA personnel who were continuously on-site during the clean-up process. All activities associated with the project, including disposal techniques and monitoring, were accomplished under agency authorization. Liquids that were disposed of at Pad 3 were not RCRA hazardous waste, based on determinations made by both agencies.

Child's Pad Cleanup

Page 14, Paragraph 2

VERSAR's description of the Child's pad cleanup is incorrect. No soil has been removed from the site to date. VERSAR's allegation that contaminated solids from the site were disposed of at the Oxbow landfill is erroneous. An ADEC decision on final disposition of the soil is dependent on the outcome of extensive analysis being performed on soil samples.

VERSAR's statement that no chemical analysis has been done to characterize the liquid waste in the drums is also false. Extensive analytical work, including, but not limited to, RCRA characterization tests, have been performed on samples taken from each drum. This data has been reviewed by EPA and ADEC and both agencies have determined that the fluids are either recycleable oils or non-hazardous waste.

Pingut Pit

Page 17

Information in this paragraph is inaccurate and misleading. The Pingut pit was excavated into permafrost. Thus, no migration of its contents occurred nor is likely to occur. ARCO operated the pit as an oily waste pit under ADEC permits. Prior to closure, the pit contained oily waste which was situated below permafrost grade. Moreover, free oil was continually removed from the pit, such that accumulations of oil were negligible.

Overburden used to fill the pit was not saturated with oil nor has the overburden after closure become contaminated, to our knowledge. As part of the ADEC approved closure plan, any contaminated overburden was placed in the bottom of the pit; a seven foot lift of adjacent uncontaminated material was used to fill the pit followed by an additional two foot cap of fresh uncontaminated gravel. ADEC has required annual monitoring and has not expressed any concern to our knowledge.ARCO is not aware of any contamination of "the surrounding area."

ARCO Drillsite 4

Page 18, Paragraph 1

An oil sheen was first observed in August 1987, not "several years" ago as alleged. A spill report was filed at the time of the incident and a diligent cleanup effort was pursued in 1987 and 1988. Details of this incident are available upon request.

ARCO's Crude Oil Topping Unit (COTU)

Page 18, Paragraph 2

"Naptha is added to the diesel to increase octane for use in gasoline engines."

This statement is incorrect. Naptha is not now produced and has never been added to diesel for use in gasoline engines.

The waste streams claimed to be generated by the COTU are erroneous. VERSAR has misstated facts regarding COTU bundle sludge.

COMMENTS BY

THE STANDARD ALASKA PRODUCTION COMPANY

ON

THE DRAFT REPORT ENTITLED

"SITE ASSESSMENTS - NORTH SLOPE ALASKA"

PREPARED FOR

THE U.S. ENVIRONMENTAL PROTECTION AGENCY

BY

VERSAR

INTRODUCTION AND SUMMARY

This paper presents comments by Standard Alaska Production Company (SAPC) on the draft report entitled "Site Assessments - North Slope Alaska," prepared for the U.S. Environmental Protection Agency by Versar as part of EPA's study of oil industry waste management practices. Versar prepared this report on the basis of a visit to the North Slope between June 14 and 17, 1988. Representatives of SAPC and ARCO Alaska, Inc. accompanied Versar on their tour of the oilfields.

The expressed purpose of the Versar report is to present the results of "environmental site assessments of North Slope oil production facilities." However, Versar has taken an unwarranted additional step: they speculate about the reasons for conditions they observe and in so doing grossly exaggerate or inaccurately represent the state of waste management on the North Slope.

The authors of the Versar report present a series of subjective observations on the facilities they visited, and based on these one-time observations, allege improper waste management by the oil companies and oilfield service contractors. These allegations simply represent conjecture on the part of the Versar personnel visiting the sites. It is clear that the Versar report can only be considered a memorandum providing a trip report; it is not a carefully documented technical report. Furthermore, the Versar report, while "documenting" cases of "poor" waste management, has failed to consider the fact that industry is taking positive steps to advance the state of the art of waste management in the Arctic.

The body of SAPC's comments will detail inaccuracies in Versar's treatment of SAPC's North Slope facilities and of service company facilities at Deadhorse. First of all, several general comments are in order to place the Versar document in proper perspective and to demonstrate that the report is crippled by several key deficiencies:

Lack of Understanding of Oilfield Operations

Numerous instances in the report demonstrate that the authors have little technical grasp of the operation of oilfield facilities. For example, "tank bottoms" are equated with "vessel cleanouts," the discussion of fire suppression systems at the gathering centers is totally inaccurate, and the discussion of the gathering centers shows a lack of understanding of the flow of fluids from the wells to the production facilities.

Use of Inaccurate Generalizations

Sweeping generalizations about operations on the North Slope are made with no supporting data, and in many cases, the statements are simply wrong. For example, in discussing the ARCO Materials Storage and Drum Disposal Area in the Kuparuk Field (page 2), Versar states that operators cannot store hazardous waste on site for more than 90 days because Alaska has no RCRA Subtitle C treatment, storage, or disposal facility. The fact is that there is no permitted disposal facility in Alaska. However, both ARCO and SAPG operate hazardous waste storage facilities at Prudhoe under RCRA interim status permits.

A second example occurs on page 3, where Versar claims that there are "no State regulatory siting or reclamation requirements" for gravel pits. In reality, the State Department of Natural Resources requires mining plans for gravel pits, and these plans must include provisions for reclamation. Further, abandoned gravel sites cannot be used for indiscriminate disposal of garbage and debris. One site -- the Oxbow Landfill -- is an old gravel pit that has been developed under permit for disposal of such waste.

Poor Documentation

The authors of the report attribute most of their information to unnamed sources (e.g., "according to State officials," "according to ARCO personnel," "according to Standard personnel," etc.). It is extremely important that such sources be identified. In SAPC's opinion, it appears

that Versar has distorted what was said to them, and unless the sources are identified, there is no way to judge their credibility.

It is evident that no research was conducted to verify any of the statements attributed to these sources. The result is that the authors present information as confirmed fact when many of these claims are distorted half truths or simply inaccurate statements. Volumes of data may be found in agency permit files, inspection records, and facility technical monitoring data. Thus, Versar could have had access to sufficient information to properly characterize the sites they visited.

Poor Knowledge of Regulations

In at least three instances, the authors demonstrate ignorance of regulations they cite. First, in discussing reserve pit wastes at SAPC's Y Pad, Versar claims that State regulations require that workover wastes be segregated from muds and cuttings. There is no such state regulation.

Second, in reference to the ARCO Oily Waste Recycling Center at Kuparuk, the authors state that the "four storage tanks are surrounded by a gravel berm" and then say that "the volume of the berm is inadequate to contain 110 percent of the volume of tanks as required by Federal SPCC regulations" (page 4). In reality, EPA spill prevention, control and countermeasures (SPCC) regulations call for the diked area to have the capacity to contain the contents of the single largest tank plus freeboard for precipitation [40 CFR 112.7 (d)(2)(ii)].

Third, the authors claim on page 7 that SAPC does not have a "RCRA Subtitle C hazardous waste generator's permit." First of all, there is no such thing as a "hazardous waste generator's permit." Resource Conservation and Recovery Act (RCRA) regulations require that a generator such as SAPC obtain a hazardous waste generator number, which SAPC has done. Furthermore, SAPC C Pad storage facility is operated as a hazardous waste storage facility under a RCRA interim status permit (40 CFR 270).

Subjective Observations

The language of the report belies the subjective nature of most of the observations. Phrases such as "unsightly spill area," "severely inadequate," and "lacked adequate secondary containment" are used throughout the report and are not explained. The use of such language reinforces the assertion that the Versar report is a biased and inaccurate collection of observations rather than a carefully documented, objective technical report.

Failure to Account for Current Management Practices

If the Versar report was meant to cover the waste management practices in the North Slope oilfields, then it is severely deficient in that regard. Waste management techniques on the North Slope have been evolving and practices which may have created some problems in the past are no longer used. For example, SAPC no longer uses reserve pits for disposal of oily workover wastes, which are now either disposed of in Class II injection wells or are recycled through the production process. Furthermore, SAPC now removes all fluids from reserve pits as soon as spring thaw occurs and disposes of these fluids by injection.

Other examples of new SAPC waste management practices include the following:

- Installation of impermeable liners in reserve pit embankments in all areas where past seepage has occurred
- Use of solids handling equipment for workover operations to separate solids from liquids so that the liquids can be injected in Class II wells
- Use of liners in all SAPC pigging pits
- Use of high-speed centrifuges to dewater pigging wastes to facilitate injection of the liquids
- Testing of new technology for grinding drill cuttings for subsequent injection

COMMENTS ON EXECUTIVE SUMMARY

Paragraph 2

In this paragraph, Versar claims that pigging wastes are dumped in unlined pits. Until this year, SAPC never used pits to contain pigging wastes -- they were placed in tanks. Because of the length of flow lines requiring pigging this year, SAPC used lined pits to contain the wastes.

The statement that oily wastes are "disposed of on the ice and snow" implies that such wastes are deliberately spilled on the ground and left there. SAPC diligently reports all spills and ensures that proper cleanup occurs. The fact is that snow and ice aid in such cleanup efforts because they limit the spread of any spill and make it easier to remove.

Paragraph 3

In this paragraph, Versar states that "according to State officials and others, the performance and integrity of some Class II disposal wells on the North Slope are questionable." The fact is that deep wells have been used successfully on the North Slope for oil extraction, gas and water injection and disposal since the original discovery of oil and gas on the North Slope in the late 1960's. Furthermore, all SAPC injection wells are in compliance with Underground Injection Control (UIC) regulations. Operation of these wells is regulated by the Alaska Oil and Gas Conservation Commission, which administers the Class II UIC program in Alaska. Injection wells are tested periodically to ensure their integrity.

With the construction and operation of hundreds of producing oil wells at Prudhoe Bay, well design is a well-understood and well-engineered technology. Because of the permafrost on the North Slope, all Class II wells are basically constructed to Class I standards, with casing strings, pressure monitoring in the static fluid between the tubing and casing, and cementing of the casing to the surface. The 1800 feet of permafrost acts

as a confining layer along with multiple shale layers that separate the injection zones. It is important to note that EPA has granted a drinking water exemption for much of the North Slope due to the (1) salinity of aquifers underlying the permafrost and (2) the high cost of recovering and treating groundwater for drinking water in the Arctic.

Paragraph 4

There is a significant problem with the statement in this paragraph that many of the spent chemicals at contractor facilities meet RCRA hazardous waste criteria. A material is not a hazardous waste until it is used and discarded and then meets the RCRA criteria. Most contractor materials that Versar would have observed are simply stored useable product. Chemicals used in drilling and workover operations at the wellsite become part of the crude oil and produced water streams that are sent to the gathering facilities for separation, recovery and injection. Very little material is ever spent and "discarded". Versar has not provided any data to show that these contractor chemicals meet RCRA criteria.

Paragraph 5

It is true that problems have arisen in the service area at Deadhorse. However, what Versar fails to point out are the positive steps industry has voluntarily taken to deal with these problems. The oil industry has assisted in the cleanup of sites at Deadhorse, even though the industry has no responsibility for these sites, which are leased by the service companies directly from the state or federal government. The two cases of North Slope Salvage, Inc. and Childs Pad provide examples of the oil industry stepping in to fund the cleanup of sites abandoned by their owners. Other facilities have been abandoned and are in need of remedial action, and the industry is looking at ways to solve these problems. Versar fails to distinguish among service businesses that have failed, those that are failing, and those that are still in operation.

In addition, Versar overlooks the considerable efforts made by service companies to improve their waste handling. Since 1986, some contractors

have obtained waste oil burners to use waste oil as fuel for service company buildings on the North Slope. The Alaska Department of Environmental Conservation recommended that these burners be obtained by the service companies. Additionally, contractors purchased oil/water separators to properly segregate oil from rinsing operations so that the oil could be used in the space heaters. The capacity of these space heaters are well below a BTU value established by EPA for regulation as industrial boilers or incinerators. These space heaters are simply "unpermitted" by virtue of the fact that they are unregulated, not because contractors are violating the law. These operations are still regulated because black smoke emissions are not allowed, and ADEC monitors for its occurrence. If Versar has evidence that other activities exist that are in violation of the law, they should state it and cite a reference.

COMMENTS ON TEXT

ARCO Pad 3 (p. 5)

At the end of Paragraph 2, Versar claims that the ARCO Pad 3 facility accepts "heat exchanger bundle sludges from ARCO's diesel fuel producing topping unit." Heat exchanger bundle sludges from the topping unit are not exempt wastes and are not currently handled at the Pad 3 Oily Waste Injection Facility. ARCO flushed the topping plant pipes with diesel periodically to generate what is referred to here as "bundle sludge". This material is a liquid rather than a solid and was only accepted at the Pad 3 Oily Waste Injection Facility for injection, rather than at the oily waste pit, before August 1985, when ARCO operated the injection wells as a hazardous waste disposal facility under RCRA interim status. The facility no longer operates as a hazardous waste injection facility and no longer accepts this waste.

In Paragraph 3, potential problems from hydrogen sulfide (H_2S) are discussed. It is true that some H_2S levels are increasing in the production stream at Prudhoe due to waterflood activities for enhanced recovery of oil at specific well pads. Versar tries to correlate a higher level of sulfate-reducing bacteria found in gathering center tank bottoms with possible corrosion problems at the Pad 3 wells that are not cathodically protected. Tank bottoms are not injected, nor would cathodic protection be needed to detect or prevent corrosion if they were. The injection wells are cemented to the surface with alkaline Portland cement that combats pipe corrosion. In addition, the annulus of each injection well at Prudhoe Bay is filled with fluid that is monitored for changes in pressure to detect leaks.

Versar notes that H_2S levels may exceed concentrations that are potentially fatal to humans. Because high H_2S levels are found in enclosed systems, there is little risk of human exposure. Furthermore, employees working around these facilities are trained in protective measures.

In Paragraph 4, Versar claims that the "in the last few months of 1988, the quantity of waste accepted by the facility has dramatically increased" and that the oily waste pit is nearing capacity. Increased fluid volumes at ARCO's Pad 3 result from pit dewatering activities at the oily waste pit. The pit is estimated to contain approximately one-tenth of its solids handling capacity.

In Paragraph 6, Versar says that "Chemical analysis is not performed on the incoming sludges." Chemical analysis is not required because these materials are clearly considered exempt wastes under the EPA's Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes (EPA 1988).

In Paragraph 7, Versar refers to the oily waste pit as having a "polypropylene" liner. The authors are likely referring to either "polyethylene" or "polyurethane."

Standard's Hazardous Waste Storage Site (p. 7)

In Paragraph 1, Versar claims that the overpack drums at SAPC's C Pad hazardous waste storage facility are stacked too high. The overpacks that are double-stacked are empties stored for future use. The elevated height of the pallets is necessary to keep a sufficient space between drifted snow and the drums. The drums are easily visible at this height during weekly inspections.

SAPC was granted interim status for the C Pad hazardous waste storage facility by EPA Region X on November 30, 1982. On August 11, 1980, SAPC submitted a generator notification to EPA as required by the RCRA regulations (40 CFR 270). There is no such thing as the "hazardous waste generator's permit" Versar mentions in their draft report. SAPC is allowed to store wastes for more than 90 days before shipping them for disposal because the C Pad facility is an interim-status RCRA hazardous waste storage facility.

Contrary to what Versar says in Paragraph 3, all waste oil that is stored at C Pad is chemically analyzed for the parameters listed in 40 CFR Part 266 (the used oil criteria). The oils are tested twice. First, oils that are accumulated at the SAPC Vehicle Maintenance Shop's on-site accumulation tank are tested for metals, flashpoint, and organics. Organic and metal analysis is performed by Chemical and Geological Laboratories, an independent laboratory in Anchorage. All analyses are kept on record at the Prudhoe Bay facility. Prior to shipment, the waste oil from the storage tank at C Pad is again sampled and analyzed to verify that the waste oil meets the specification used-oil requirements of Part 266.

Waste oil accumulated by Standard at C Pad in 1987 was shipped to Chemron, a waste oil recycler in Palmer, Alaska. Chemron has been inspected by EPA and the Alaska Department of Environmental Conservation and has declared its activity as a waste oil marketer to EPA. Before 1987, waste oil was shipped to Lilyblad Petroleum's waste oil recycling plant in Tacoma, Washington (the Poligen facility). This facility has declared its waste oil marketing activity to the State of Washington.

Standard's Santa Fe Pad Drum Cleaning and Crushing Operation (p. 7)

Versar claims that drum rinsate from SAPC's drum cleaning and crushing operation at Santa Fe Pad is subject to RCRA Subtitle C regulation. This is not the case. Empty drums received at the Santa Fe Pad Warehouse are from well site locations and have been used for well returns, which consist largely of dead crude and diesel. Minute quantities of other exempt production chemicals would be found as drum residues at this facility. The residues from these drums are not regulated as hazardous waste under Subtitle C of RCRA. Residues that are regulated as hazardous waste are those collected from drums that contain "commercial chemical products" ("U" or "P" listed wastes) [40 CFR 261.33(c)]. Any solid waste residues collected from drum rinsing operations at Prudhoe are not in the category of spent "commercial chemical products."

The statement in Paragraph 2 that the liquid collected from the facility is injected at Pad 3 is incorrect. All rinsate collected from the Santa Fe Warehouse is sent to SAPC's Gathering Center 1, where the material is recycled through the processing system, recovering oil to the crude stream. Any water residuals retained in the wastewater system are commingled with produced water for underground injection. No solids are collected at the Santa Fe facility.

Contrary to what Versar says in the second paragraph on page 8, the Santa Fe Warehouse Pad has a concrete floor with a 2- to 3-barrel collection sump under the floor. All drum rinsate is flushed directly into a 500-gallon collection tank inside the warehouse. No rinsate is allowed to flow onto the floor, and no waters are drained to the pad and adjacent gravel areas. All sump waters are collected and recycled through Gathering Center 1.

Flow Stations - Gathering Centers (p. 8)

In the fifth paragraph in this section, Versar states each flow station and gathering center "has large reserve pits or emergency pits to contain spillage from fire suppressant systems." Some of the older sections of SAPC's gathering centers have floor drains that run to these emergency deluge drain pits. These drain lines are dry, and their purpose is to provide drainage of a large spill of crude oil released from an accident in the facility. The floor drains in the facilities have 2- to 3-inch lips around them so that flow of oil and/or fire water or chemical from the fire suppressant system would reach the emergency pits only in an extreme emergency.

Standard's BOC Camp Sewage Treatment Plant (p. 9)

The Versar report incorrectly states that the discharge from SAPC's Central Sewage Treatment Facility goes directly to the tundra. In fact, the discharge is to a lake near the Base Operations Center (BOC), while sludge is incinerated onsite. The facility operates under a National

Pollutant Discharge Elimination System (NPDES) permit and meets secondary standards. A laboratory at the facility monitors the plant effluent daily.

The Central Sewage Treatment Facility contains the following primary and secondary treatment capabilities: primary screening, trickling filters, extended aeration, clarification, chlorination, sludge conditioning, sludge thickening, and incineration.

Standard's Y Pad Drill Site (p. 9)

Versar's discussion of SAPC's Y Pad drill site provides additional examples of Versar's lack of understanding of oilfield operations and distortion of what they observed. In the first paragraph, Versar states that the Y Pad reserve pits "provide little or no freeboard for the contents of the reserve pit." The fact is that Versar observed the pit in mid-June prior to SAPC's fluid management work for the summer. Thus, the pit contained snow and ice from the winter and would appear full, even though in actuality, the Y Pad pits are only about half full of muds and cuttings -- a fact which Versar would have observed later in the summer.

In the third paragraph on Y Pad, Versar references a "thick, beige substance swirled in oil" and observes that State regulations require that North Slope operators segregate workover wastes from muds and cuttings. First of all, there is no such State regulation. Secondly, when Versar visited Y Pad, a development well was being drilled, and the substance seen was from oil-based muds which had been previously deposited during development drilling and not from a workover or a completion or stimulation. At the time of Versar's visit, water-based muds were being discharged to the pit from the rig on the well pad. It is important to note that SAPC recently decided not to discharge any more oil-based muds to reserve pits, even though this practice is allowed. SAPC suspended discharging oil-based muds to reserve pits pending the results of the extensive monitoring program SAPC is conducting to ensure that the pits are providing proper containment.

In the fourth paragraph, Versar discusses spills of crude oil and chemicals and implies that spilled material is discharged to the tundra by pad snow-removal activities. While it is possible that some very small spills -- from equipment drips for example -- can be mixed with snow removed from pads, the fact is that most spills occur at the oil processing facilities rather than at the well pads. And most spills are from fuel handling and equipment problems -- not from flowlines and wells -- and occur on the pads rather than on the tundra. Furthermore, spills are reported to the appropriate agencies and are promptly removed.

It should also be noted that pad snow removal activities are regulated and that snow disposal areas adjacent to pads are designated by the State of Alaska. Each year, SAPC submits a snow removal plan to the Alaska Department of Natural Resources for approval, and in the spring, DNR officials inspect the snow disposal sites to ensure that the approved plan has been followed.

Deadhorse Sites - General

First of all, it is important to note that the oilfield service area at Deadhorse is not under the control of the oil companies operating on the North Slope. The private service companies at Deadhorse build their own facilities on land leased from the State of Alaska. Thus, responsibility for enforcing spill cleanup and pad rehabilitation falls with the State. (Additionally, the Federal Aviation Administration manages the leases adjacent to the airport.) However, as a responsible neighbor, industry has voluntarily assisted in cleanup efforts. The drop in oilfield activity on the North Slope over the last few years has resulted in a decrease in the number and types of service companies with facilities in Deadhorse.

With the closure of the ARCO Pad 3 injection well to hazardous wastes in mid-1985, the Deadhorse contractors had to find alternative ways for handling, minimizing, and disposing of wastes. They did, in fact, work together as a group through the Alaska Support Industry Alliance (an industry support group) and received support, information and advice from

the Alaska Department of Environmental Conservation (ADEC) and EPA, as well as the larger oil companies. In 1986, a task group of industry, agency, and service company representatives conducted an analysis of waste handling and disposal options for the North Slope (Ad Hoc Task Group, 1986). Waste reduction efforts were undertaken on-site. Products were sometimes changed for less toxic or more recyclable products; waste oil meeting the specification of used motor oil was utilized for fuel in waste oil burners or was filtered and blended with diesel for use in diesel engines. Batteries were sent to battery recyclers. In addition to working on their own operations, the Alliance organized a group to clean up and monitor their own activities in Deadhorse. The task group has been successful in encouraging cleanup of state-leased properties, especially those with active owners and on-site staff. They have been less successful with companies who have gone out of business or cannot be located.

Fraley Service Company - Deadhorse (p. 10)

When SAPC personnel visited the Fraley pad in the summer of 1988, they noted the barrels referred to by Versar. Some of these barrels were empty, while some were partially full. It was noted that the floor of the steel building on the site has some oiled areas. However, no significant odors were detected, especially since the building is continually open at one end. Also, the "hundreds of used vehicle-type batteries" were not observed on the site; a few batteries were seen inside the building. There are no current operations at the site.

Deadhorse Hotel Lease Tract (p. 11)

Site visits by oil company personnel have noted the barrels, batteries, and garbage. The hotel trash was apparently incinerated on site (based on visual observations) and consisted of putrescible wastes and burnables. Versar says that the small-capacity incinerator at the site was unpermitted by the State. What they do not say is the State does not require a permit for such small incinerators. due to the small size. Furthermore, the claim by Versar that the incinerator ash found on

site "potentially contains hazardous constituents" is totally unsupported. There would be no reason for hazardous constituents to be a normal part of this waste stream. Incinerator ash is not a listed hazardous waste [in fact, it is specifically excluded -- 40 CFR 261.4 (b)], and is normally tested only when the constituent hazardous waste streams could potentially accumulate in the ash in sufficient quantities to meet the characteristics of the EP toxicity tests.

Forward Alaska Service Company (p. 13)

In discussing the Forward Alaska Service Company facility, Versar refers in the first paragraph to a lake as being "the source of all drinking water for facilities on the North Slope." The lake referred to is actually the North Slope Borough water impoundment, not a lake. Also, while this is a major water source, it is not the only source for the Prudhoe Bay area -- and it is certainly not the only water supply for the entire North Slope. The "North Slope" refers to the area stretching from the Canadian Border in the east to the Chukchi Sea in the west and south to the Brook Range -- a vast area indeed.

In the third paragraph, Versar states that some of the drums on this site contain isocyanate compounds. It is important to note that the most common isocyanate-containing compound used on the North Slope is used to make foam insulation. While this product is a chemical requiring proper handling, is not the same chemical component as the extremely toxic methyl isocyanate. Also, these compounds, if reusable, are frequently recycled by foam manufacturers. The isocyanate component in the foam insulation is not regulated as a hazardous waste.

The Forward Alaska Service Company site has recently become the subject of an agreement between the Alaska Department of Natural Resources and the Alaska Support Industry Alliance. The Alliance is a trade organization whose members have volunteered to construct a lined, bermed area to contain the used drums on the Forward Alaska pad.

North Slope Salvage Site (p. 14)

First, while the North Slope Salvage Site (NSSI) existed in 1982 and 1983, it was on property leased by Purcell, with a gentleman's agreement for sublease. Since cleanup of the site, NSSI has not re-established any operations in Deadhorse.

It is important to point out that as part of the SAPC- and ARCO-supported cleanup operation, the liquids that were injected at the ARCO Pad 3 facility were non-hazardous waste (primarily water), while the hazardous wastes (due to ignitability) were sold as boiler fuel and therefore recycled. Agency approval was obtained for both disposal actions. ADEC stated in its incident report that the final inspection of the site by ADEC showed that "all drums had been emptied, crushed and disposed. Pockets of contaminated soil had been removed from the site and disposed" (Mach, 1984).

At the end on the paragraph on NSSI, Versar states that "No chemical monitoring or sampling of surrounding tundra was conducted in order to determine the adequacy of cleanup." This simply is not true. ADEC reported in 1984 that samples had been taken of the NSSI gravel pad on August 1 and 2, 1983, to check for contamination in the gravel following completion of the cleanup. In addition, six samples were collected from standing water northwest of the site on August 16, 1983, to check for off-site contamination (Mach, 1984). These water and gravel samples were analyzed using a GC/MS, and while organic compounds were found in the samples, they were in such low concentrations that they were not of concern to ADEC (Mach, 1987). Following completion of the cleanup, ADEC personnel also visited the site several times and observed only very light sheens on the water between the gravel pad and the containment dike that had been built around the pad (Mach, 1987). ADEC has conducted no other sampling program at the site.

It is interesting that Versar attributes to "State officials" the statement that no sampling has taken place subsequent to the NSSI

cleanup. In fact, State representatives conducted the sampling described above. One wonders who Versar was talking to.

Child's Pad (p. 14)

At Child's Pad, both ARCO and SAPC voluntarily went to the State to help initiate site cleanup at this service contractor pad in Deadhorse where abandoned solid waste had been accumulating. Neither SAPC nor ARCO had control over the site nor was responsible for abandoning any of the material on the site. ARCO and SAPC made an agreement with the State to remove the solid waste to the North Slope Borough Landfill, collect any abandoned drummed material in a lined containment area, and sample the gravel pad to determine the extent of any contamination.

Versar claims that "no chemical analyses had been performed to characterize these wastes." The solid waste cleanup was completed September 1, 1987. Full chemical analysis was performed by the Prudhoe Bay Unit on all drummed material collected at the Child's Pad cleanup. The analyses were conducted by the independent laboratories AM Test Inc. and Rocky Mountain Analytical in August and September of 1987. A summary of this test data was provided to ADEC in October of 1987. All drummed material is currently stored in overpacks in a lined containment area awaiting final disposal arrangements. Gravels were disposed of in the North Slope Borough Landfill oily waste pit after analysis showed they were not hazardous. A plan to recycle the waste oil that meets the used spec fuel criteria and for handling the hazardous waste disposal of the drummed waste is currently being developed for the State.

Oxbow Landfill (p. 15)

In the second paragraph, the authors state that the oily waste pit at the North Slope Borough Oxbow Landfill has been in operation for only one year. In fact, the oily waste pit has been operating under an Alaska Department of Environmental Conservation permit since 1981. The permit was reissued on March 3, 1987 (Permit No. 8636-BA023). The pit operation has been in the same location since 1981.

As Versar says in the third paragraph, a chemical analysis is not required to accompany waste sent to the oily waste pit for disposal. However, the North Slope Borough does require that a manifest accompany each shipment and that the manifest certify that the waste meets the Borough criteria for disposal in accordance with their permit. Additionally, the contents of the oily waste pit are analyzed regularly. All drums accepted by the landfill must be triple-rinsed and crushed.

In the first paragraph on page 16, Versar states that when they visited the landfill, "a significant volume of industrial and municipal waste was exposed." It is important to note that this waste would not include putrescible or other burnable solid wastes, all of which are incinerated. Furthermore, the statement that housekeeping at the Oxbow Landfill has improved "in response to the debate over leasing in the Arctic National Wildlife Refuge" is but another example of the unsupported speculative statements made throughout the draft report. This statement is again attributed to unidentified "State officials." The fact is that if housekeeping has improved at the facility, the motivation behind that improvement is not something that Versar can identify based on their cursory assessment. Furthermore, the Borough's motivation is irrelevant.

The claim in the second paragraph on page 16 that water from the landfill could be carrying contaminants to the Put River is unfounded. Since the level of the river is significantly higher than the level of the water in the landfill, such migration is not possible.

North Slope Borough Municipal Incinerator (p. 16)

Versar suggests by implication that the North Slope Borough incinerator would not efficiently burn or destruct "potential" organic hazardous constituents and other toxic compounds. However, the North Slope Borough Landfill does not accept hazardous waste.

East Dock Pits (p. 17)

The East Dock facility is located on the eastern shoreline of Prudhoe Bay approximately 3 miles southwest of Heald Point and 2 miles west of the westernmost channel of the Sagavanirtok River. The three-celled reserve pit was constructed in 1980 and was used for disposal of muds and cuttings during the 1981 and 1982 exploration drilling seasons. Two of the cells received mud and cuttings, while the third cell received treated sanitary wastes from the East Dock camp.

Construction permits issued for the reserve pits in November 1980 stipulated that SAPC would design and conduct a monitoring program to test the impermeability of the sump design over a five-year period. The program design was submitted to the Corps of Engineers in 1982, and two preliminary reports of results were provided in 1984 and 1985, with a final report submitted in 1986. The report concluded that no adverse environmental impact to the surrounding area was observed (SAPC 1986).

The Versar report not only misstates the approved East Dock revegetation plan, but also inaccurately describes the status of the East Dock pits. Negotiations with the Alaska Department of Environmental Conservation for close-out and monitoring of the two mud-containing cells of the reserve pit began in late 1984 and involved the submission of a number of different close-out and revegetation options. A final approval to proceed with the selected close-out was received from ADEC August 7, 1987. During development of the close-out plan, the possibility of placing different levels of overburden in the two pits was discussed with ADEC as an experiment. However, in the final plan, it was decided that both pits should be filled to the same level.

Gravel was placed in the two mud-containing sumps in late August 1987, and sampling monitors and thermisters were installed. As result of late summer rains, overburden could not be placed until the summer of 1988. Gravel and overburden are typically not thawed sufficiently for use on the North Slope until mid-June. The overburden work on East Dock was completed by late July 1988 and was followed by hydroseeding (Versa-

personnel visited the site in June 1988). Thermister measurements and water quality samples were taken both in the summers of 1987 and 1988. A report of the results from the 1987 sampling will be submitted to ADEC prior to October 1, 1988.

The Versar statement that "revegetation efforts on closed reserve pits on the North Slope have met with little success" is a prime example of the undocumented and inaccurate generalizations that characterize this document. A wealth of environmental data on North Slope ecology, hydrology, vegetation, and soils has been gathered during the past 15 years that provides a firm basis for assessing and implementing rehabilitation. Revegetation work has been completed successfully on oil spill sites and on drill pads, access roads, material sites, disposal sites, and other gravel structures in the National Petroleum Reserve - Alaska (NPRA), along the Trans-Alaska Pipeline System, and in the Prudhoe Bay area.

Because the Prudhoe Bay oilfield has only just reached its mature phase of development after more than 10 years of production, for the most part no facilities have been abandoned necessitating reclamation. Since the field is expected to have a life of 30 or more years, large-scale reclamation work is well in the future. In the case of East Dock the pit was also being used for research by both industry and regulatory agencies. The East Dock pit closure is test of proposed closure and revegetation techniques for Prudhoe Bay.

Furthermore, SAPC is developing a comprehensive revegetation and rehabilitation research program to advance the knowledge and techniques available for long-term rehabilitation. In addition, a pilot rehabilitation project is under way at a gravel exploration well pad (BP Pad 22-33-11-13), which will be dormant-seeded and fertilized.

Nabor's Pad - Dowell Schlumberger - Deadhorse (p. 19)

In the second paragraph of this section, Versar claims that "According to State officials, dead tundra will not revegetate once the tundra mat is

saturated with a contaminant such as diesel fuel." Once again, a statement attributed to anonymous sources is put forward as the absolute truth. Research has demonstrated that if spilled oil is cleaned up and simple restoration procedures followed, vegetation in tundra areas affected by oil can recover in as little as one summer growing season (Pope and Hillman, 1982; Pope et al., 1982; Brendel, 1985). The speed and success of tundra recovery have been found to be positively correlated with the increase in the moisture level of the areas affected. Standing water in areas of low relief provides a buffer zone between the plant roots and the oil; thus only the leafy portions of the tundra mat are affected by most spills. Because of the coastal plain environment and the simple physics of oil, spills will predominantly end up in an area of low relief (wet tundra). Recovery success is also dependent on the type of product spilled. Crude oil spills have been observed to cause less damage than refined product spills; however, if standing water is present (which is usually the case), only the tops of the tundra mat are affected and recovery would be the same as for a crude oil spill.

Standard G Pad (p. 22)

On August 4, 1987, SAPC reported a spill of approximately 50 cubic yards of drilling fluids which overtopped the reserve pit walls at G Pad. The area was sandbagged and a plastic liner placed on the tundra to prevent further spreading during cleanup. The area was flushed with water which was pumped back to the reserve pit and later disposed of by annular injection. Water samples were taken to ensure that nearby tundra ponds were not affected, and restoration and dormant reseeding occurred in 1988. The area will be monitored in 1989 to ensure regrowth of tundra grasses, and additional restoration measures will be undertaken if necessary.

During the summer of 1988, liners were installed in parts of the G Pad reserve pit walls where leakage was suspected.

Standard J Pad (p. 22)

On July 24 1987, SAPC reported a spill of 40 to 50 gallons of crude oil and diesel from a leak in the north wall of the northeast reserve pit at J Pad, and on July 26, SAPC reported a spill of 5 to 10 gallons of diesel/crude from the dike wall of the west pit. Both spills were cleaned up, and impermeable embankment liners have been installed.

Versar's report of "some stained tundra outside of the repaired reserve pit" is meaningless. Since no documentation is provided, it is just as likely that the "stain" is simply tundra where new growth had not yet occurred following breakup.

Peak Service Company (p. 22)

While spills inside the containment areas should be cleaned up, the spillage referred to at the Peak Service Company pad was contained and was not contaminating the environment. No law or regulation requires that containment be provided for 55-gallon drums of product chemicals. SAPC provides containment for many of the chemical products it uses, simply because this is a good operating practice.

Schlumberger Logging Company Pad (p. 23)

Versar is speculating that an "oily sheen" seen around the Schlumberger sewer discharge was caused by oily wastes being discharged through the sewer line. The sheen could have been caused by naturally occurring organic compounds rather than hydrocarbons.

Standard Endicott (p. 23)

Extensive monitoring programs are conducted for the Endicott Development under two separate permits: the U.S. Army Corps of Engineers permit for the causeway and gravel islands and the Environmental Protection Agency NPDES permit for discharges from the production facilities.

The NPDES permit regulates the character of drilling effluents, seawater treatment plant effluents, drinking water, and sewage treatment plant discharges. The permit requires a detailed monitoring program for drilling fluid and cuttings disposal which includes a monitoring of all components and additives, their concentrations, their toxicity and the character of the effluent. The permit also requires regulation and/or treatment of the drilling effluents to meet the effluent criteria prior to discharge. Monitoring studies have been underway since 1982. Additionally, bioassays for toxicity are performed on the mud types and on mud samples from wells. The monitoring program has detected no impact on the fish or benthic biota. There is no evidence that the NPDES discharge has "disrupted the migratory patterns of nearby arctic aquatic life."

The purpose of the environmental monitoring program required under the Corps of Engineers permit is to monitor the effects of these structures on the aquatic environment. It is likely that in the first paragraph of their discussion on Endicott, Versar is echoing concerns by agency officials that the Endicott causeway has disrupted migration patterns of fish. While the agencies have expressed concern over the effect of the causeway, there has been no documentation of those concerns related to drilling fluids. While SAPC agrees that some oceanographic changes have occurred from the causeway, no negative impact on fish has been demonstrated.

The Endicott gravel mine site referred to in the second paragraph was permitted and operated under a state gravel sales agreement and an Alaska Department of Natural Resources permit. These permits require the site be reclaimed and provide for state approval of a reclamation plan. Current studies are underway by the Alaska Department of Fish and Game to determine if reflooded mining sites make good fish habitat. Another major reclamation activity includes the use of old pits for drinking water reservoirs.

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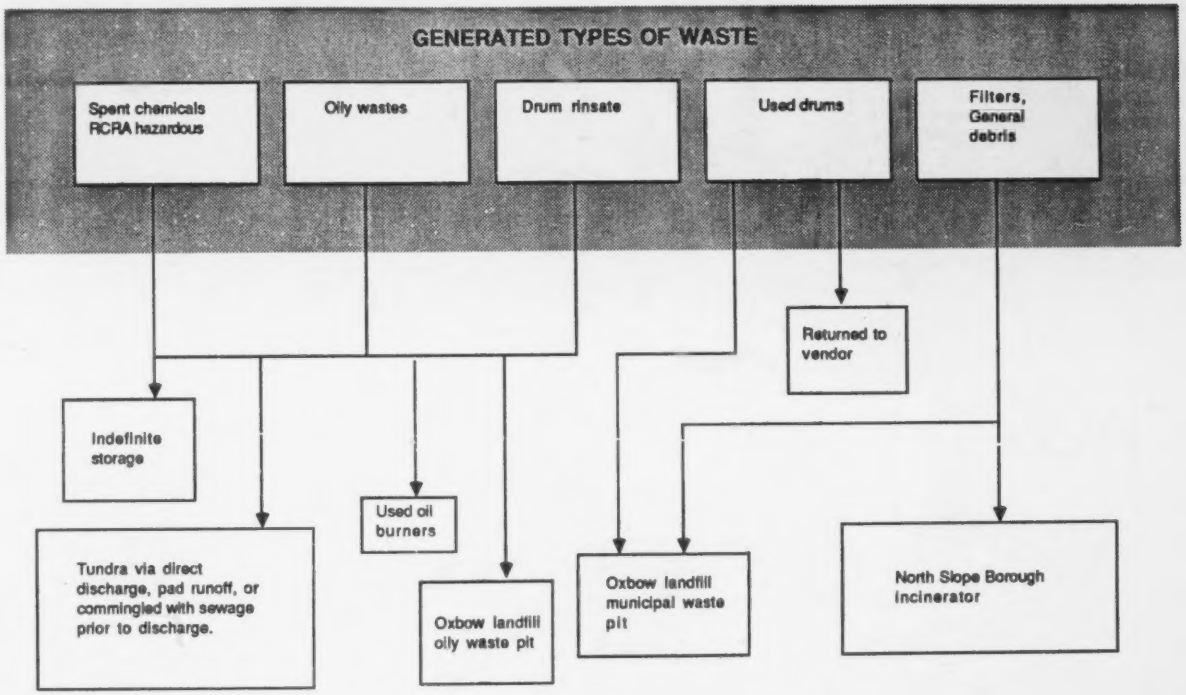
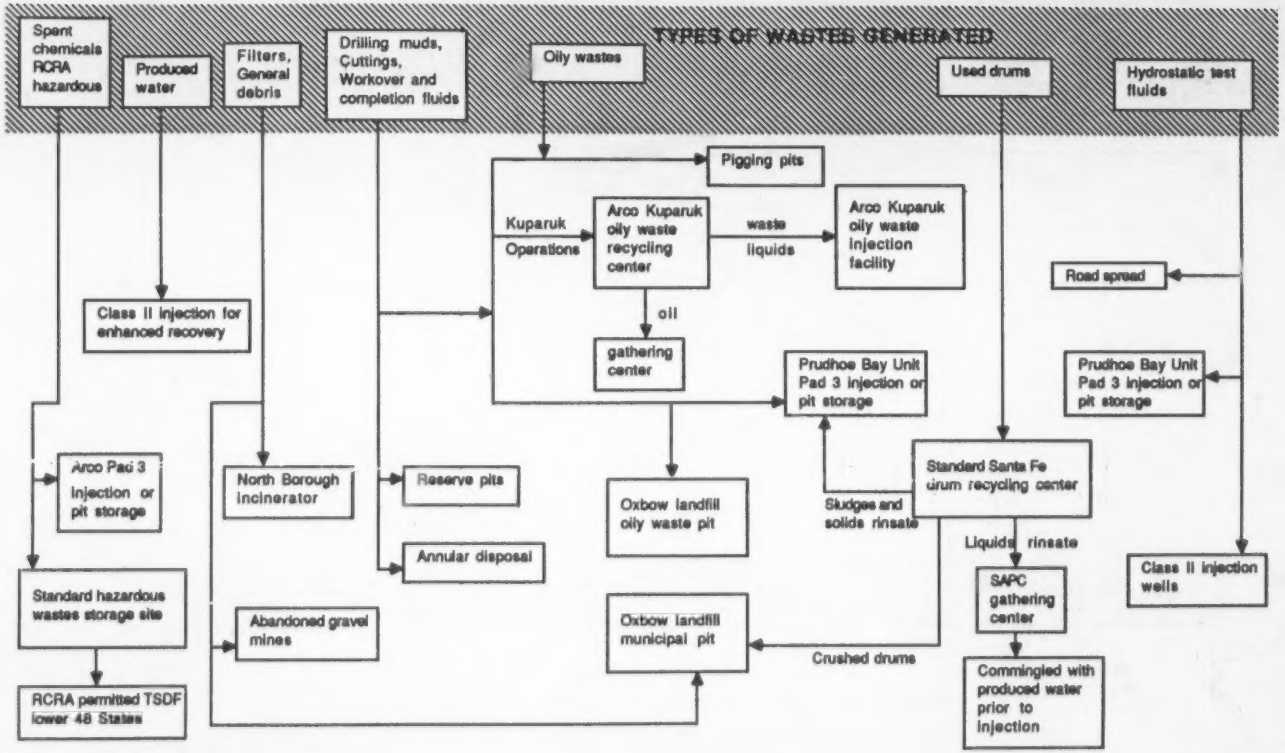
Figure 5 Disposal System for Wastes Generated by North Slope Service Companies


GENERATED TYPES OF WASTE
Spent chemicals RCRA hazardous
Oily wastes
Drum rinsate
Used drums
Filters, General debris
Returned to vendor
Indefinite storage
Used oil burners
Tundra via direct discharge, pad runoff, or commingled with sewage prior to discharge.
Oxbow landfill oily waste pit
Oxbow landfill municipal waste pit
North Slope Borough incinerator

Spent chemicals = corrosion inhibitors, solvents, biocides, pesticides, methanol, glycol, lube oils, hydraulic fluids, emulsion breakers, oxygen scavangers, scale preventatives, acids caustics, and laboratory wastes.

Figure 4 Disposal System for Wastes Generated by North Slope Oil and Gas Production Operations


TYPES OF WASTES GENERATED
Spent chemicals RCRA hazardous
Produced water
Filters, General debris
Drilling muds, Cuttings, Workover and completion fluids
Oily wastes
Used drums
Hydrostatic test fluids
Pigging pits
Kuparuk Operations
Arco Kuparuk oily waste recycling center
waste liquids
Arco Kuparuk oily waste injection facility
Road spread
Class II injection for enhanced recovery
oil
gathering center
Prudhoe Bay Unit Pad 3 injection or pit storage
Prudhoe Bay Unit Pad 3 injection or pit storage
Arco Pad 3 injection or pit storage
North Borough incinerator
Reserve pits
Oxbow landfill oily waste pit
Standard Santa Fe urum recycling center
Sludges and solids rinsate
Liquids rinsate
Annular disposal
Class II injection wells
Standard hazardous wastes storage site
Abandoned gravel mines
Oxbow landfill municipal pit
SAPC gathering center
Crushed drums
Commingled with produced water prior to injection
RCRA permitted TSDF lower 48 States

Oily wastes = hydraulic fluids, lube oils, diesel, gasoline, NGL, contaminated soils, oil-based drilling mud, tank bottoms, pigging wastes, and heat exchange bundle sludges.

Spent chemicals = corrosion inhibitors, solvents, biocides, methanol, glycol, emulsion breakers, oxygen scavangers and laboratory wastes.

Hydrostatic test fluids = water, salt water, glycol, diesel, and methanol mixtures.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 13 1989

OFFICE OF
EXTERNAL AFFAIRS

Honorable J. Bennett Johnston
Chairman
Committee on Energy and Natural Resources
United States Senate
Washington, D. C. 20510-6150

Dear Mr. Chairman:

Thank you for your letter of February 22, 1989 requesting a written statement of EPA's views on S. 406, a bill to authorize competitive oil and gas leasing and development on the Coastal Plain of the Arctic National Wildlife Refuge in a manner consistent with protection of the environment, and related amendments 3, 4, and 5.

Our statement for the hearing record is enclosed. If I can be of further assistance, please let me know.

Sincerely,

Jennifer Joy Wilson
Assistant Administrator
for External Affairs

EPA COMMENTS ON S.406
A BILL TO AUTHORIZE COMPETITIVE OIL AND GAS LEASING
ON THE ARCTIC NATIONAL WILDLIFE REFUGE COASTAL PLAIN
AND AMENDMENTS 3, 4, 5

S.406 and amendments 3, 4, and 5 together would authorize oil and gas development in the Arctic National Wildlife Refuge (ANWR) with safeguards to protect the environment of the Refuge, including air and water, fish and wildlife, the arctic ecosystem, habitat, other natural resources such as wetlands, and the marine and coastal environment. Thus the bill and amendments are consistent with the policy of this Administration as enunciated by President Bush in his February 9, 1989 address to a joint session of the Congress.

EPA supports that Administration policy; our comments are confined to suggested measures to enhance or clarify the environmental protection provisions of the proposed legislation.

To begin with a general comment, it is our view that successfully achieving the Administration's aims hinges on inclusion of amendments 4 and 5, which contain provisions essential to making S.406 meet the Administration's environmental protection standard. Amendment 4 clarifies that NEPA would remain applicable to all phases of the oil and gas development process and that no Federal or State environmental protection law would be superseded by any provision of S.406. Amendment 5 contains a number of important specific environmental protection requirements.

Role of Existing Laws and Regulations

Since reviewing the draft LEIS on ANWR oil and gas development, EPA has consistently voiced its belief that all existing environmental laws must remain applicable to any development in the 1002 Area. EPA is concerned that under S.406 the Secretary's determination of any activity's consistency with all applicable Federal and State laws and regulations would supersede that of the appropriate agency having pertinent authority. Amendments 4 and 5 address EPA's longstanding concern that NEPA and other environmental laws administered by other Federal and State agencies apply to ANWR activities, and they should be adopted.

No Significant Adverse Effect Standard

S.406 sets an enviromental standard of no "significant adverse effects." .That phrase is not, however, defined in the bills. The omission of a definition is of concern to EPA in that the standard is subject to considerable interpretation.

Minimization of Impacts Through Lease Sales

Section 203(c) would allow only 300,000 acres to be leased in any one lease sale. We question the reason for that limitation. We recommend that the identification of tracts to be offered in subsequent lease sales take into account alternatives which would minimize cumulative impacts, for example, through comprehensive planning and siting.

We believe that amendment 4, subsection 203(b) (providing for the application of NEPA to oil and gas operations on the Coastal Plain) would operate to ensure completion of a comprehensive siting plan to minimize adverse environmental effects before leasing begins.

Mitigation and Reclamation

Several potentially beneficial mitigation measures appear in the bill, including provisions for performance bonding and a reclamation fund. Section 207(b)(2) establishes performance bonds to provide for reclamation of the lease site, as well as for rapid and effective cleanup and minimization of harm from any spills. The size of the bond is limited to $1.5 million "for all development and production activities on the Coastal Plain." The bond requirement would appear to set a cap for each lessee of $1.5 million for reclamation and cleanup at all development and production operations on all leases held by an individual lessee. We are concerned that if the purpose of the proposed bonding is to provide incentive to perform reclamation, the maximum bonding requirements fall far short of the potential costs of reclamation. We believe that the bill should not set a ceiling on the amount of the performance bond required. This should be determined by the Secretary of the Interior.

Second, other reclamation monies (to be accumulated at a fixed rate per barrel of oil produced) may also be under-funded. Section 403 would establish a revolving fund with a $50 million cap at any one time. We believe that the majority of reclamation needs are concentrated at the end of the life of the field. It is our view that $50 million would be inadequate to provide the level of reclamation likely to be required at that time. Even if the cap were removed so the fund would continue to accumulate, the fund would still generate far too little for large-scale reclamation (only $160 million would be generated, assuming the mean case of 3.2 billion barrels of recoverable oil).

Finally, we are concerned about S.406 subsection 403(a) providing that the holder of the Trans-Alaska Pipeline right-of-way (currently Alyeska, Inc., a consortium of the private owner/operator companies of the existing Prudhoe Bay area oil fields) would administer the Reclamation Fund. Prudent consideration of the public interest requires that final word on

the need for and appropriateness of reclamation rest with the permit-issuing agency and not with the permit holder, who has a financial interest at stake. We recommend that the Department of the Interior administer the Reclamation Fund. For the North Slope in particular, widely differing views on the need, methods, and standards for reclamation have been taken by industry and regulatory agencies. Nevertheless, progress has been made in the form of controlled research into the potential success of various restoration methods.

Amendment 5 would strengthen and improve many aspects of S.406. However, the mitigation plan provision of amendment 5 section 301(b)(2) should be reworded to be consistent with NEPA and existing Federal agency mitigation policies (including that of the U.S. Fish and Wildlife Service) and to read as follows: "(2) a mitigation plan be implemented to avoid, minimize, and compensate (in that order and to the extent practicable) any significant adverse effect assessed under paragraph (1) of this subsection." We also recommend that development of any aspect of the mitigation plan occur in consultation with the agency or agencies having jurisdiction over that aspect of the plan (e.g., EPA and the Corps of Engineers should be consulted before approving plans for mitigation of effects on wetlands).

The amendment 5 provision (paragraph 302(b)(1)) for adoption of the mitigation measures identified in the final LEIS for the 1002 Area is positive. It should be noted, however, that these measures, by themselves, may be inadequate to avoid significant adverse effects.

EPA recommends rewording amendment 5 paragraph 302(b)(2) to be consistent with the above comments regarding the NEPA standard: "(2) seasonal limitations on exploration, development, and related activities, where feasible, to minimize adverse environmental effects during periods of concentrated fish and wildlife breeding, denning, nesting, spawning, and migration."

In amendment 5, paragraph 302(b)(6) we recommend inserting in line 18 of the provision after "equipment" the phrase "not required to be removed under any other authorities or permits."

In amendment 5, paragraph 302(b)(11) should be revised to read: "(11) the protection of wetlands, springs, streams and river systems, other natural surface drainage patterns, and riparian habitats in accordance with Federal Water Pollution Control Act requirements; and the regulation of methods or techniques for developing or transporting adequate supplies of water for exploratory drilling;"

EPA recommends that the following be added to the end of paragraph 302(b)(21): ", or as required by other agencies in authorizations or permits for which they have jurisdiction."

Subsection 207(e)of S.406 should be amended by inserting after "Secretary" the phrase ", in consultation with affected Federal and State agencies,".

Section 214(g) of S.406 addresses removal costs and liability for damages resulting from pollution of the Coastal Plain from discharges of oil or hazardous or toxic substances. EPA recommends that the term "Coastal Plain" be replaced by "Coastal Plain or adjacent State waters."

STATEMENT OF
JAMES D. WATKINS, ADMIRAL, USN (RETIRED)
SECRETARY OF ENERGY

BEFORE
THE SENATE COMMITTEE ON
ENERGY AND NATURAL RESOURCES

ON
S. 406, THE ARCTIC COASTAL PLAIN
COMPETITIVE OIL AND GAS LEASING ACT
MARCH 6, 1989

Mr. Chairman, Senator McClure, and Members of the Senate Energy and Natural Resources Committee:

I appreciate the opportunity to provide written testimony on S. 406, a bill to authorize competitive oil and gas leasing of the Arctic National Wildlife Refuge (ANWR) coastal plain in an environmentally sound manner. The question of whether to begin the process of exploration, which could lead to the development and production of the oil and gas resources in the ANWR coastal plain is one of the most important energy policy issues now before the Congress and the Administration. As indicated by the President in his recent budget message, we should proceed to tap the oil and gas resources that may be present in the Arctic National Wildlife Refuge. In doing so, we should also heed the President's directive that we proceed judiciously with respect to the environment.

The Department's statement does not address the specific leasing provisions of the bill, but rather focuses on the relationship between ANWR's potential oil and gas resources and the Nation's energy problems and policies. We expect that the Department of the Interior will provide the Committee with specific comments on the bill's leasing provisions.

Since being confirmed by this Committee last Wednesday morning, I have had the opportunity to meet privately with the Governor of Alaska, Steve Cowper. Governor Cowper and I discussed extensively development of ANWR and the importance of moving as quickly as possible to enact legislation and establish a plan for responsible development. At this same meeting, the Governor indicated his view, which I share, that development of ANWR should be an essential component of the national long-range energy strategy which I hope to develop over the next year.

However, I would like to reiterate for the record what I told Governor Cowper. I would be strongly opposed to delaying consideration of S. 406, or delaying development of ANWR, until after this national energy strategy has been properly designed, reviewed, and put into place.

There is no question in my mind, after listening to the statements of Committee members on February 22nd, that one of my early tasks will be to address our nation's increasing dependence on foreign oil. No matter how I look at the issue of the energy security of the United States, no matter what study I review or what plan I look at to encourage the use of a new mix of transportation fuels, or improved energy efficiency and conservation, the increased availability of domestically produced oil will still continue to be essential to our energy security well into the next century. We need the additional oil ANWR will provide. Mr. Chairman, I would like to submit for the record an article from today's WALL STREET JOURNAL entitled "Petroleum to Keep Rank as Most Valuable Commodity," which outlines some important issues in this area.

Without development of ANWR, along with many other initiatives, we will be unsuccessful in making America as energy independent as possible. Responsible, environmentally sound development of ANWR is one of the first tools I will need to be an effective Secretary of Energy, and I can assure members of this Committee that ANWR will be part of this strategy, and early development of ANWR will be key to making the strategy work.

Leasing Of The ANWR Coastal Plain Is An Integral And Essential Part Of National Energy Policy

The ANWR coastal plain has been described as the most promising prospect for a major new discovery of oil and gas in the United States. Given current trends of declining

domestic production, growing consumption, and rising dependence on oil imports from the Middle East, it is essential that we start to explore and develop this prospect without further delay. The potential for ANWR's oil resources to increase the U.S. reserve base by as much as 34 percent is an extraordinary opportunity that we cannot afford to postpone or delay indefinitely.

Clearly, development of ANWR's oil resources, even if they exceed the most optimistic estimates, will not be sufficient to fulfill the Nation's continuing need for oil. Indeed, the Nation must continue efforts to substitute other fuels for oil in many applications, to make additional conservation gains, and to prepare for potential interruptions in oil supplies.

Nevertheless, the fact remains that the Nation will remain heavily dependent on oil, particularly in the transportation sector, well into the next century. If we do nothing to stem the decline in domestic oil production, through both responsible exploration and efficient recovery, then we will be compelled to meet our oil demand through growing imports, which will be supplied increasingly from insecure sources. Where the potential exists to develop new oil resources in a cost-effective and environmentally sensitive manner, it is essential that the Federal Government allow efforts to realize that potential.

Despite Lower Oil Prices Today, Current Energy Trends Raise Serious Concerns

The United States today enjoys the rewards of successful efforts over the past decade to reduce consumption of energy in general and oil in particular, to increase production of oil and other energy sources outside of OPEC, and to deregulate domestic energy markets. Today, oil supplies are abundant, and prices are lower than they were in the early 1980s. To many Americans, the gasoline lines and high prices experienced ten years ago are only a fading memory. However, disquieting trends of growing oil consumption, declining domestic production, and increasing dependence on oil imported from the Middle East indicate that today's favorable situation will not last forever.

The volatile and generally lower oil prices over the past few years have made it difficult for producers of high-cost U.S. oil reserves to compete in the world market. Thousands of low output wells in the United States have been temporarily or even permanently abandoned, and many high-cost development projects have been shelved. The number of active oil and gas drilling rigs in the United States has declined to below 800, compared to 2,000 rigs operating in 1985 and 4,000 in the peak year of 1981.

This reduced drilling activity has been insufficient to compensate for the natural decline in production from existing reserves. Consequently, domestic oil production today is about 1 million barrels per day lower than in 1986. Furthermore, production from the Prudhoe Bay field in North Alaska, which provides about one-fifth of total U.S. crude oil production, is beginning to decline.

According to projections in the Energy Information Administration's Annual Energy Outlook, total U.S. oil production (including crude oil, natural gas liquids, condensates, and refinery gains) is likely to decline from the recent peak of 11.3 million barrels per day in 1985 to about 8-9 million barrels per day by the year 2000. At the same time, domestic oil consumption is projected to increase by 5 to 15 percent. U.S. net imports therefore are projected to grow from their lowest recent level of 4.3 million barrels per day in 1985 to 9-12 million barrels per day in 2000, accounting for one-half or more of domestic oil consumption. Although past experience with oil market projections indicates that these trends are by no means inevitable, it is important to recognize the strong likelihood of rising U.S. imports.

Many other non-OPEC countries also are likely to experience declining production and growing consumption over the next decade. As the United States and other countries import more oil between now and 2000, they will increasingly turn to OPEC suppliers—in particular those located around the Persian Gulf, where the bulk of the world's oil reserves is located.

Of the 8-10 million barrels per day of spare production capacity currently available in the world, about two-thirds is in Saudi Arabia and other Persian Gulf countries. Moreover, the Persian Gulf region holds about 66 percent of the world's oil reserves. OPEC countries outside this region hold another 11 percent of world reserves. The United States has only about 3 percent of total worldwide reserves. Not only do Persian Gulf and other OPEC countries possess the largest oil reserves in the world, but their reserves also are the least expensive to produce.

Department of Energy projections indicate that OPEC's share of the world market will increase to 50 percent by 1995, and that the Persian Gulf share will reach between 35 and 40 percent. These market shares would be significantly higher than today's levels of 42 percent for OPEC and 28 percent for the Persian Gulf. In fact, the trends indicate that by the year 2000, the Persian Gulf countries' share of the world market may approach the historical peak level of 45 percent recorded in 1976. Thus, as we approach the end of the century, we may no longer see the surplus oil production capacity which is currently holding oil prices down.

OPEC oil supplies generally are controlled by governments rather than by private companies, and these governments coordinate their oil production and pricing policies. Over-reliance on OPEC suppliers can subject the world economy to the damaging effects of high prices caused by cartel production cutbacks. There are additional risks from over-reliance on Middle Eastern oil suppliers. Revolutions, politically motivated production cuts, regional wars, or conflicts instigated by outside powers could disrupt oil supplies, increase prices, and inflict economic hardship on oil-consuming countries throughout the world. Vulnerability to such threats could affect the ability of the United States to conduct its foreign policy.

Increasing worldwide dependence on Persian Gulf and other OPEC oil suppliers could increase the nation's vulnerability to price spikes and supply disruptions. Our situation at the turn of the century could be particularly precarious.

The Nation's Energy Policy Must Be Founded On The Sensible and Economical Use Of All Available Energy Resources

In preparing for our future energy needs, we must acknowledge that the state of our economy and our national security depend in part on the availability of adequate supplies of energy at reasonable prices. At the same time, we must seek a balance among energy needs and concerns for the overall economy, environmental quality, free and fair competition, and manageable Federal budgets.

There is no single government action that alone can have a sufficient impact to resolve the Nation's energy problems. A sound energy policy must be broadly based, making use of all available fuels and all cost-effective actions. This must include emergency preparedness, fuel switching, conservation, and domestic production.

Strategic Oil Stockpiles Provide A Defense Against Short-Term Disruptions

Recognizing that oil supplies are vulnerable to disruption, the United States has built a very substantial strategic stockpile of oil. The Strategic Petroleum Reserve (SPR) now contains

563 million barrels of oil that can be drawn down and distributed at a rate of about 3.25 million barrels per day. Germany and Japan also have built large strategic oil stockpiles. Many other countries have similar programs, although most of them lag behind the United States, Germany, and Japan. Worldwide stockdraw capabilities would be sufficient to respond to supply disruptions of the duration and magnitude that occurred during the 1970s.

Over The Longer Term, The Nation Must Turn To Energy Sources Other Than Oil

While emergency oil stocks can dampen the economic effects of short-term supply disruptions, they cannot overcome the effects of longer disruptions or the long-term exercise of market power by a small group of oil-producing countries. Our national energy policy therefore must include a number of long-term actions that can help provide alternatives to oil. Some of the actions being pursued by the Administration include:

- Reforming Natural Gas Regulations. Natural gas is an abundant and clean-burning fuel that has not yet met its full potential, largely because of excessive government regulation. Some progress has been made, both by Congress and by Federal regulatory bodies (for example, legislation repealing restrictions on fuel choices and regulations promoting open access to transportation). Still, more remains to be done. In particular, the President has said that, at long last, Federal controls on natural gas at the wellhead should be abolished.

- Developing Clean Coal Technologies. Coal is playing an increasingly important role in supplying the Nation's demand for electricity. There are important environmental concerns, notably acid rain and the threat of global climate change, that must be addressed in connection with the use of this resource, however. The Department of Energy and industry are jointly funding projects to demonstrate innovative new technologies for reducing emissions from coal-fired boilers and increasing the efficiency of coal combustion processes.

- Improving Opportunities for Nuclear Power. Nuclear power has been the fastest growing energy source in the United States, but the last order for a U.S. nuclear plant was placed in 1978—thus this growth will soon stop. The Bush Administration understands the importance of improving the licensing process for nuclear plants, minimizing unnecessary delays and costs, improving safety, and providing facilities for waste disposal.

- Funding Research and Development of Renewable Energy Technologies. Renewable energy sources, other than hydroelectric power, currently provide only a small part of our energy needs. This Administration supports basic research efforts which could help lower the costs of solar and other renewable energy technologies so that they might be able to play a larger role in the future.

- Funding Research and Development of Energy Conservation Technologies. The Administration supports basic research and development of a wide range of energy conservation technologies in all energy-using sectors, as well as research in basic science that may lead to new energy efficient technologies. Individual technological advances include development of improved windows, lighting systems, engines, and industrial processes. The Department also conducts programs to support use of conservation technologies.

Energy Conservation Must Continue, But Conservation Alone Cannot Meet All Of Our Future Needs

The United States has made major strides in improving its energy efficiency. Since 1973, fuel efficiency of new cars and trucks has increased by 87 percent, growth in residential energy use has been kept to less than 5 percent despite over a 20 percent increase in the number of households, and industrial energy use per dollar of economic output has declined by more than 20 percent.

The overall decline in oil use since 1973 has been substantial. With the exception of transportation, all other energy using sectors showed reductions in oil consumption. These sectors are using about 2 million barrels per day less than in 1973. Today, the Nation uses only about 0.5 million barrels of oil per day to generate electricity and only about 1.3 million barrels per day in the residential and commercial sectors combined. Transportation and other motor fuel uses account for over two-thirds (more than 11 million barrels per day) of U.S. oil consumption. Oil use in the industrial sector is about 4 million barrels per day, of which over half is used for feedstocks rather than for energy uses, *per se*.

Although energy conservation improvements are expected to continue, U.S. oil dependence will increase through the next decade. If energy efficiency did not increase, our oil use would likely grow from 17 million barrels per day to 22.6 million barrels per day by the year 2000. However, DOE projections are based on the assumption that additional oil conservation of about 4 million barrels per day will be achieved, reducing year 2000 oil consumption to about 18 to 19.5 million barrels per day. But this is still 1 to 2.5 million barrels per day more oil than we currently use. This additional oil use is expected to be necessary to meet the needs of an expanding economy. When declining U.S. oil production is taken into account, we expect that oil imports will be at least 2 and perhaps as much as 6 million barrels per day more in 2000 than today.

Efficiency improvements and substitution of other types of energy for oil are vital parts of the Nation's energy strategy. But improved efficiency, fuel switching, and alternative fuel use will be insufficient, by themselves, to reduce U.S. oil import dependency over the next decade. Despite the contribution of conservation, significant oil import dependency will remain.

Full And Efficient Use Of Domestic Oil Resources Is Imperative

Given the conclusion that the U.S. economy will continue to depend heavily on oil for many years to come, it is vital that the Nation seek to obtain the most from its domestic oil resource base. Domestic oil production plays a very important role in the U.S. energy balance, providing about one-quarter of total energy consumption. Yet today we use more oil in the transportation sector alone than we produce domestically. Furthermore, unless oil prices increase dramatically, U.S. oil reserves and production are expected to decline further.

There is a balanced program of cost-effective actions that can be taken to help stem the decline in domestic oil production. One important action would be to allow responsible exploration and development of the country's best domestic oil prospects. Many of the more accessible oil resources onshore in the lower 48 States already have been developed. Although there remains a significant potential for recovering more oil out of these mature areas, the potential for discovery of large new oil fields in these areas is slight. In fact, 80 percent of all additions to the U.S. reserve base in recent years are the result of extensions and revisions to existing reserves. Discoveries of new fields account for the remainder. The last major new discovery in the United States was the 10-billion-barrel Prudhoe Bay field, discovered in 1968.

In order for companies to make important additions to U.S. oil reserves, the government must provide the proper environment by:

- allowing companies to explore and develop frontier areas on Federal lands, particularly in Alaska and on selected portions of the Outer Continental Shelf;
- assuming a leadership role in research, development, and technology transfer of enhanced oil recovery techniques focused on the economical recovery of the oil and gas resources that are contained in known reservoirs; and
- ensuring that U.S. taxes do not discourage the development of U.S. oil resources, a consideration recognized in the President's recent oil and gas tax proposals.

Environmentally Sound Exploration and Development of ANWR's Coastal Plain Can Provide Substantial Benefits to the Nation

The bottom line is that the United States needs a balanced approach to energy. We need to encourage conservation and switching to fuels other than oil, and we need to encourage development of domestic oil resources, whenever such measures are economical and consistent with sound environmental protection practices. Allowing companies to conduct environmentally sound exploration and development of ANWR and to produce the oil if they find it to be economic is a logical and necessary part of our balanced energy policy.

The Department of the Interior estimates that the ANWR Coastal Plain—located just 65 miles to the east of Prudhoe Bay—may contain 4.8 to 29.4 billion barrels of oil in place. Estimates of recoverable oil range from 600 million to more than 9.2 billion barrels—a potential 34-percent increase over the current U.S. reserve estimates of 27 billion barrels.

The Coastal Plain of ANWR also could contain 11.5 to 64.5 trillion cubic feet (tcf) of natural gas in place. There are no estimates available as to whether these gas supplies could be economically developed, but if they were found to be economic, they could make a very substantial contribution to total U.S. gas reserves.

Experience shows that it takes more than 10 years from initial discovery to first production of Arctic oil and gas. Consequently, any production from the ANWR area is not likely to start before the end of the century. By then production of crude oil from the United States is expected to decline from the present 8.0 million barrels per day to less than 6 million barrels per day. At the same time, Alaskan oil production will decline from the current 2.0 million barrels per day to 0.9 million barrels per day.

If ANWR's oil reserves approach the size of the reserves at Prudhoe Bay, ANWR eventually could provide as much as 1 to 1.5 million barrels per day of domestic oil production, thus offsetting part of the production decline in the lower 48 States and at Prudhoe Bay.

The oil industry has performed remarkably well for over a decade at Prudhoe Bay. The industry has implemented technological, environmental, and operational practices that have safely developed not only Prudhoe Bay, but also the Kuparuk, Lisburne, Milne Point, and Endicott fields. For over 20 years, extensive exploratory drilling and thousands of seismic surveys in the Central Arctic area have been conducted without significant adverse impacts on the environment or wildlife. Such a record provides encouraging support for authorizing exploration and development of the ANWR coastal plain.

A report released recently by the Office of Technology Assessment documents some of the improvements in technologies and operating practices which have lowered the costs and at

the same time reduced the environmental effects of Arctic oil development. The report also discusses various estimates of the recoverable oil reserves in the ANWR coastal plain, concluding that the economic prospects for development of ANWR oil may be more favorable than originally estimated. I think that this report provides some additional evidence that America may be able to develop the oil resources in ANWR's coastal plain in an economical and environmentally sound manner.

It should be remembered that exploration and production in ANWR could provide substantial economic as well as energy benefits. First, exploration and development would generate jobs, particularly in the currently depressed oil sector. The domestic oil drilling and related industries, which have been severely affected by the 1986 oil price collapse, would experience increased demand for their services. The oil industry estimates that it has spent about $36 billion on development of Alaska's North Slope oil fields since 1974, including $8 billion on the construction of the Trans-Alaska Pipeline. Since 1980, all 50 States have benefited from oil industry purchases of equipment and supplies for the Alaskan oil fields and to transport the oil to refiners.

If large oil and gas reserves are found on ANWR's coastal plain, production of these reserves could provide additional economic benefits throughout the country. Consumers would benefit from the availability of these secure supplies and could even benefit from lower oil prices.

Producing American oil in ANWR could be much less expensive than buying foreign oil. Excluding taxes and royalties, a 3.2 billion barrel field in ANWR (the Interior Department's mean estimate) would cost an estimated $11.50 per barrel to find and produce. If oil prices rise to $30 per barrel early in the next century, production of ANWR oil would result in a net national saving of over $12 per barrel produced.

Net imports of crude oil and refined petroleum products accounted for $38 billion, or more than one-quarter of the total U.S. merchandise trade deficit of $137 billion in 1988. As oil prices and oil imports increase over the next decade, the U.S. oil import bill can be expected to grow. Oil production from ANWR's coastal plain could reduce substantially what we pay for imports. For example, under the most optimistic assumption that production of 1 to 1.5 million barrels per day could be attained, and if oil prices should rise to $30 per barrel early in the next century, production from ANWR could reduce the U.S. import bill by $11 to 16 billion per year.

Oil producers provide government revenues through payments of lease bonuses, royalties, and income taxes. If substantial quantities of oil are found on the ANWR coastal plain, production of these resources could provide significant revenues for the Federal, State and local governments.

Given the potential for ANWR oil production to contribute to meeting the Nation's projected energy needs early in the next century, and given the large economic benefits that could be derived from ANWR development, it is important that the Government open up this area for exploration and development activities. The environmental consequences of development can and must be mitigated, but we cannot afford to close off access to our best domestic oil and gas prospect. We know that our economy will be heavily dependent on oil early in the next century, but if we do not act soon, any commercial quantities of oil that may be found on the ANWR coastal plain will not be available then. The Department of Energy therefore strongly supports Congressional approval of legislation, such as S. 406, that would allow leasing of the ANWR coastal plain.

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Petroleum to Keep Rank as Most Valuable Commodity

Once Seen as Dying Industry, Oil Will Fuel World Into Next Century

By James Tanner
Staff Reporter of The Wall Street Journal

An old fuel is back on the fast track.

It's petroleum, the world's most valuable commodity.

For more than a decade it has been fashionable to view petroleum—the chief energy source for much of this century—as a dying industry. The 1973-74 Arab oil embargo set off price gyrations through the 1970s and into the '80s that contributed to shrinking oil's share of total energy use.

Part of a Series on Future Issues and Trends Published in The Journal's Centennial Year

But there is new evidence that the world still is very much wedded to oil, for better or for worse, well into the next century. Thanks to the return of cheap and easy oil and to fading memories of the gasoline lines of the 1970s, petroleum consumption suddenly is surging world-wide.

"Oil is going to remain the center of the energy system for a couple decades or more," says George Q. Lumsden Jr., petroleum director for the Paris-based International Energy Agency.

New Buoyancy

Indicative of the new buoyancy, consumption spurted 3% last year, double expectations. Oil use in the non-communist world exceeds 50 million barrels a day, close to the 1979 peak.

"The most serious error in the business of economics last year was the underestimating of petroleum demand," says Theodore Eck, chief economist of Amoco Corp. He and others predict demand will continue to climb as much as 2% a year, or one million barrels a day.

Such forecasts, of course, are open to challenge. It is true that before the 1970s price run ups, oil use was rising at a faster pace than now, amounting to more than half the world's energy consumption.

Still, petroleum's share today, at slightly more than 40%, is holding as energy use grows. That's a telling statistic, for the world is on an energy binge expected to carry well beyond the year 2000. Robust national economies, industrialization of developing countries such as South Korea, and a diminished sense of urgency about energy conservation are factors.

European Demand

Now in the middle of the first major study on the energy outlook to the year 2010, Kevin Leydon, an energy economist at the Commission of the European Community in Brussels, expects demand in Europe to grow by one-third for the period. He looks for a much larger increase, two-fold, in the centrally planned economies, or communist bloc, and he sees a three-fold jump in the developing nations.

What's more, says Mr. Leydon, the big energy problem facing the 12 nations of the European Community is a slowing in the drive toward more efficient fuel use. "I'm a bit pessimistic that energy efficiency will have the emphasis it should," he says. Others estimate that for each percentage point gain in the world's economic output, energy use must increase about 0.75%, well above the 0.5% of recent years.

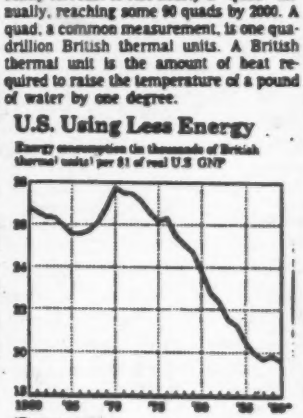
Some experts hope that the current slowdown in energy efficiency will prove temporary. "We are just starting to see the quantum leaps in technology" leading to further efficiency, says Norman Rigby, a Menlo Park, Calif., energy forecaster.

Search for Substitutes

Nevertheless, in the U.S., where energy consumption has been sluggish, use is currently forecast to rise nearly a "quad" annually, reaching some 90 quads by 2000. A quad, a common measurement, is one quadrillion British thermal units. A British thermal unit is the amount of heat required to raise the temperature of a pound of water by one degree.

U.S. Using Less Energy

Energy consumption (in thousands of British thermal units) per $1 of real U.S. GNP



*Forecast
Source: U.S. Energy Department, Economic Report of the President 1988

Obviously, the energy mix will change during the next few decades. Apprehension over the apparent greenhouse effect (a global warming) and acid rain, which are blamed on fossil fuels, will continue to spur the search for substitutes, and some esoteric sources should emerge. Costs may drop enough that solar and other alternates can supply a slightly bigger share. But no energy expert sees any near-term substitutes for fossil fuels—oil, natural gas and coal. "There is nothing else around," says John Lichtblau, president of Petroleum Industry Research Foundation, of New York.

For a while, it appeared energy consumers were moving away from petroleum—to nuclear power, coal and natural gas. But costs and safety concerns have stalled nuclear energy, with the only remaining momentum, at the moment, in France and Japan. Abundant coal could gain in the generation of electricity, but faces growing problems in most applications unless there [illegible] generally anticipated in turning it into a clean-burning fuel.

Natural gas can be an attractive substitute for oil and coal in many uses because it is less polluting, but it is expensive to transport across oceans and doesn't have the benefit of oil's established logistics system. The assumption is that gas use will expand rapidly, but generally on the continents where it is produced. For example, in Europe, in the 40-year span of Mr. Leydon's study dating from 1970 to 2010, gas's share of total energy consumption is expected to double to 22%.

In the U.S., the trend toward natural gas is particularly pronounced. Most major oil companies are expanding their search for natural gas while placing lesser emphasis on oil. Such companies as Amoco, Mobil Corp. and Exxon Corp., are already placing much more emphasis on gas, particularly in the U.S.

No Immediate Challengers

Still, oil has no immediate challengers to its energy crown on a world-wide basis. That also means the world is again locked into the related risks of a petroleum-dominated energy world. As oil production outside the Organization of Petroleum Exporting Countries peaks and begins to decline within the next few years, the focus of production will shift to a handful of countries ringing the Persian Gulf, where the bulk of the world's reserves are.

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Some suggest this could set the stage for a return of the political upheavals and price escalation of the 1970s. But others say leading members of OPEC such as Saudi Arabia are convinced that relatively low oil prices are in their best interests in the long term. They don't want to spur oil exploration in other areas—in the high-cost U.S., for example, where production has rapidly declined since the 1986 crash—or lose customers to alternate energy sources likely to be launched on the next petroleum price spike.

But relatively low oil prices will discourage investment in research and development of alternate energy sources. That's because many potential alternatives, which might be competitive with $40 to $50 a barrel oil, can't compete on a cost basis with $18 a barrel oil.

"In the short run, cheap oil keeps down natural gas and coal," says Robert H. Horton, a managing director of British Petroleum Co. "In the longer run, these and others—including our exotic old- friends like solar, shale, windmills and the atom—curb excess greed on the part of oil."

'Price of Oil'

"The price of oil is crucial to all energy," says Dale Steffes, a Houston energy consultant. Over time, energy use falls and supplies expand as prices rise. Price drops bring the reverse.

Petroleum prices today average between $14 and $18 a barrel, half the level of the early 1980s. The future direction is subject to debate, not surprisingly since a former consensus forecast of $80 oil by now was off the mark. Generally, prices are expected to remain somewhat flat for a few years and then rise gradually.

Many agree with the Petroleum Industry Research Foundation's energy economists who see prices averaging between $15 and $20 a barrel, in real terms, through the 1990s. "We don't see a $25 or $50 world nor a $10 world, but we could still have violent swings," says Lawrence Goldstein, the foundation's executive vice president.

For its latest "base-case forecast" of U.S. energy consumption, however, the Energy Department assumes oil prices will reach $25 a barrel, in 1986 dollars, by the year 2000. Still, the department expects U.S. energy consumption to total 90.6 quads in the year 2000, up from slightly under 80 quads last year.

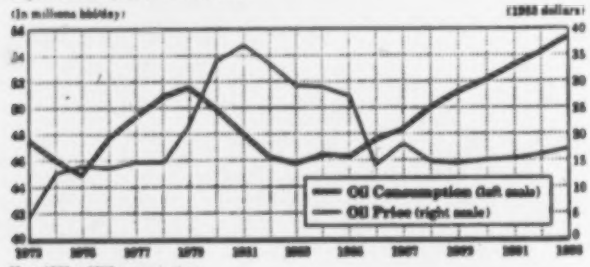
Oil use will climb although its share of the total will fall slightly to 41% from the current 42%, the department forecasts. What's more, the department sees U.S. dependency on imported oil rising to 55% from 37% during the next 12 years.

The International Energy Agency uses yet a higher figure of $30 a barrel by the year 2000 in its new energy outlook for the 24-nation Organization for Economic Cooperation and Development. Actually, the analysis looks ahead to the year 2005, and the agency expects the OECD energy requirements to grow between 1.2% and 1.6% annually during the period.

"This means that in 2005 energy consumption will be something like 4,900 million tons of oil equivalent," compared with the current rate of around 3,900 million tons, says George Kowalski, economics advisor to the agency. Also, he sees consumption of oil rising steadily although its share of the total energy mix might drop by as much as three percentage points from the current 42.5%.

World Oil Consumption Will Rise

World oil consumption in millions of barrels a day and oil prices based on U.S. refiners' import costs in 1988 dollars a barrel



Note: 1989 to 1993 are projections

Sources: Arthur Andersen & Co., Cambridge Energy Research Associates, U.S. Energy Department, and First Boston Corp.

STEVE COWPER
GOVERNOR

STATE OF ALASKA
OFFICE OF THE GOVERNOR
JUNEAU

SENATE COMMITTEE ON
ENERGY AND NATURAL RESOURCES
RECEIVED
MAR 07 1989
WASHINGTON, D.C. 20510

February 27, 1989

The Honorable J. Bennett Johnston
United States Senate
Washington, DC 20510

Dear Senator Johnston:

A major issue before the 101st Congress will be whether to permit oil and gas development on the coastal plain of the Arctic National Wildlife Refuge (ANWR). Last year, bills to authorize environmentally responsible exploration and development were reported by the Senate Energy and Natural Resources Committee and the House Merchant Marine and Fisheries Committee. I urge prompt action by Congress this year.

OVERVIEW

Last summer, we produced the six billionth barrel of Prudhoe Bay oil. This means that more than one-half the total proven 10 billion barrels of recoverable oil have been produced, and that the largest field in North America has or will begin a production decline in the near future. With Prudhoe Bay currently accounting for 25 percent of all U.S. oil production, the reality is that, as this source declines, oil must be replaced by more domestic production or by imports. All North Slope oil is used for domestic consumption.

U.S. oil production has dropped to its lowest level in 25 years, while domestic consumption of petroleum products is at a peak for the 1980s and is increasing at about 2 percent a year. This drop in domestic production and the rise in consumption have increased demand for imported petroleum.

In 1973, when the Arab oil embargo caused such severe economic dislocation, the U.S. was only 35 percent dependent on imported oil. Today, the U.S. is approximately 43 percent dependent on such oil. By the early 1990s, imported oil will account for over 50 percent of domestic demand.

The inevitable Prudhoe Bay decline, the rising level of imports, and the 10-15 year lead time that is necessary for oil development in the Arctic, leads me to the inescapable conclusion that we must begin now if we are to explore, develop, and produce ANWR oil (assuming oil is found) by the turn of the century.

Some concern has been expressed that we need a national energy policy before ANWR is opened for development. A national energy policy is important to this country, but certainly we must realize that whatever our national energy policy is, oil will be a component. The crucial issue is where that oil will come from. Because ANWR is the most promising unexplored petroleum province in North America, this area must be factored into our national energy policy, no matter how that policy may evolve.

In a similar vein, I have heard the argument that ANWR should not be developed because the best we can expect to recover is a 6 month supply of oil. The analogy of course is inappropriate. It completely disregards the reality of how oil is produced.

Prudhoe Bay best illustrates the problem with this type of argument. The total production capability of this field could also be expressed in terms of days or months. Doing so masks the fact that since 1977 Prudhoe Bay has produced 1.8 million barrels a day for this nation, currently 25 percent of our domestic production. This type of production, combined with the federal and state revenues generated, the jobs created, and the diminution of imports, provides a better illustration of what we can expect should ANWR be opened.

I have also heard some say that while oil prices are low and oil is abundant, we should "drain America last." This, of course, assumes a future stable supply of foreign oil. It also disregards the time frame for Arctic development and the role imported oil plays in our rising trade deficit. Oil imports are responsible for 25 percent of the trade deficit.

BACKGROUND

By way of background, ANWR is located in the northeastern corner of Alaska and comprises 19 million acres. The only area that would be open to oil and gas activity is the 1.5 million-acre coastal plain, or 8 percent of ANWR. However, according to the Interior Department, only 12,000 acres (less than 20 square miles) is likely to be affected by development. This area equals only eight-tenths

of one percent of the coastal plain and a mere sixty three one-thousandths of one percent of ANWR.

Although there has been much debate about designating ANWR lands as wilderness, it should be noted that 42 percent of ANWR (8 million acres) is already established as wilderness. Included in this category are 450,000 acres of the coastal plain and 30 miles of coastline. The 450,000-acre coastal plain wilderness adjoins Canada's 3 million-acre Yukon National Park.

HYDROCARBON POTENTIAL

The ANWR coastal plain lies between the oil- and gas-rich Canadian MacKenzie Delta and Prudhoe Bay. The Interior Department estimates there is a 5 percent chance of finding at least 9.2 billion barrels of recoverable oil under the coastal plain, perhaps the largest oil discovery in U.S. history. Thomas Marshall, a well-known Alaskan geologist who conducted a private study for the National Wildlife Federation, concluded that the federal estimates of hydrocarbon potential are conservative.

The Interior Department estimates there is a 19 percent chance of finding oil on the coastal plain. History shows that unexplored areas produce oil discoveries only 5 percent of the time. Thus, a 19 percent chance of finding oil, almost four times more than usual, presents an excellent opportunity. Geologists agree that ANWR represents this nation's last opportunity to find a giant oil field of the magnitude of Prudhoe Bay. For perspective, it is noteworthy that prior to drilling some industry officials estimated that there was only a 2 percent probability that the Prudhoe area contained as much as 2 billion barrels of oil. We now know 23.5 billion barrels were initially in-place at Prudhoe Bay.

Development of the coastal plain could yield a net national economic benefit of more than $150 billion. New jobs, lower balance of trade deficits, and increased tax revenues at every government level would reach all 50 states. Since 1974, oil companies that have developed the North Slope oil fields have pumped more than $36 billion into businesses in every state.

FISH AND WILDLIFE

The existence of valuable fish and wildlife resources in ANWR has been recognized for many years. Athapaskan Indian, Inupiat, and Inuvialuit Eskimo cultures have depended on many of these resources for generations. With proper

mitigating measures, development can occur with minimal impacts on fish and wildlife. For example, by allowing only necessary developments in zones along major rivers and along the coast, the impacts on fish, musk, oxen, polar bears, waterfowl, and shorebirds can be minimized.

In contrast, some areas, such as spring-fed fish over-wintering areas, are so sensitive to development that most activities--especially water withdrawal--should not be allowed.

Wildlife biologists have concluded that a 242,000 acre area is especially important for reproduction of the Porcupine Caribou Herd. The State is confident that if this area receives special attention, and if appropriate stipulations are in place for the remainder of the coastal plain, then oil and gas exploration and development can proceed in ANWR while adequately protecting the Porcupine Caribou Herd.

In addition to our statutory authority over resident fish and wildlife in ANWR, we stand ready to use our considerable experience with oil development elsewhere to assist federal agencies with minimizing impacts on fish and wildlife populations and habitats in ANWR.

WASTE MANAGEMENT

Equally important to the environment is the manner in which development and production wastes would be disposed of. Time and experience with waste management in the Arctic over the last 20 years have provided vastly improved technology and management techniques. The State believes that the track records of both the industry and the government regarding development and the regulation of development on the North Slope provide a good foundation for opening ANWR to responsible oil and gas development. We can assure you that Congress has at its disposal the technology and the regulatory tools necessary to protect the coastal plain's environment.

JOINT FEDERAL/STATE MONITORING

An essential element of any approach to mitigating impacts on fish and wildlife, as well as protecting the area's environmental quality, is cooperation between the federal and state governments and the industry. To this end, we believe that Congress should establish a joint state/federal interdisciplinary team to oversee and participate in project planning, project design review, permit actions, field monitoring and compliance. Similar joint state/federal teams have been used successfully in Alaska for large scale

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development projects such as the Trans-Alaska oil pipeline system and the preconstruction phase of the Alaska Natural Gas Transportation System.

REVENUE DISPOSITION

Related to the issue of development is the matter of revenue disposition. The Alaska Statehood Act gives Alaska 90 percent of government revenues for mineral leasing on federal lands in Alaska. Congress approved the 90 percent allocation to compensate for the vast amount of land retained in federal ownership. This allocation to Alaska is consistent with allocations to other states. The Mineral Leasing Act of 1920 provides that 90 percent of government revenues from oil and gas leasing on public lands accrue to the states. In the lower 48 states, this dedication takes the form of a direct grant of 50 percent and a deposit of 40 percent in the Reclamation Fund, which is used to the benefit of the states.

It has been suggested that if ANWR is developed, the State of Alaska should receive less than its full share of the government revenues from mineral leasing. Not only would this treat Alaska differently from other states, but it would violate the Alaska Statehood Act.

In addition to this proposed reduction, a further restriction on Alaska's claim to its royalties has been proposed. The provision provides that following enactment of ANWR legislation reducing Alaska's royalty share, if Alaska chooses to challenge the reduction in court, the entire ANWR leasing scheme would fall.

A "blackmail" clause of this type is offensive and does not represent good public policy. The practical effect of this provision is for Congress to give one state, Alaska, a veto over whether ANWR will be open and whether ANWR will be an element of this nation's energy policy. Certainly, the nation should not be penalized if one state goes to court to test a claim arising under its statehood act. Further, the provision violates the basic concept of fairness by penalizing Alaska for asserting its rights under its statehood act.

LAND EXCHANGES

Another area of concern is the so-called ANWR land exchanges. Former Interior Secretary Donald Hodel proposed to trade approximately 166,000 acres in ANWR to six Native Corporations and their oil industry partners in exchange for

891,000 acres of surface estate in other refuges in Alaska with an estimated value of $538.7 million.

There are compelling national reasons why these trades should not proceed. In September, 1988, the Government Accounting Office (GAO) released its report on the proposed exchanges. The GAO recommended that the Secretary of the Interior discontinue consideration of the proposed land exchanges. The GAO further suggested that if the Secretary of the Interior decided to proceed with the proposed exchanges and presented them to Congress for approval, the Congress should disapprove them. The GAO cited the following concerns with the proposed exchanges: 76 percent of the land selected would provide limited wildlife and habitat protection, undervaluation of ANWR oil and gas interests, overvaluation of the surface estate of the private lands proposed for exchange, failure to retain a royalty provision for the benefit of the government, and lack of any competitive bidding process for the oil and gas tracts.

CONCLUSION

The State firmly believes that the coastal plain has tremendous potential to contribute to this nation's economic strength and energy security. If we work together, legislation can be passed that will open the area to exploration, development, and production. At the same time, we can provide the environmental measures necessary to protect and preserve the natural resources in the area. The State of Alaska strongly supports the opening of the coastal plain.

Thank you for your consideration of my views.

Sincerely,

Steve Cowper
Governor

American Institute of Merchant Shipping

1000 16th Street, N.W., Suite 511, Washington, D.C. 20036-5705
Telephone (202) 775-4399 Telex 89424 AIMSHIP WSH

March 6, 1989

The Honorable J. Bennett Johnston
Chairman, Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman,

Enclosed please find a brief statement of the American Institute of Merchant Shipping (AIMS) which we respectfully request to be included in the Hearing Record before the Committee on Energy and Natural Resources on legislation to allow oil and gas leasing in the Arctic National Wildlife Refuge.

We appreciate the opportunity to submit this statement for the March 6, 1989 hearing and are available to respond to any questions members of the Committee may have.

Sincerely,

Ernest J. Corrado

Ernest J. Corrado
President

STATEMENT OF

ERNEST J. CORRADO, PRESIDENT

AMERICAN INSTITUTE OF MERCHANT SHIPPING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

MARCH 6, 1989

The American Institute of Merchant Shipping (AIMS) appreciates the opportunity to submit this brief statement for the hearing record on legislation to allow oil and gas leasing within the Coastal Plain of the Arctic National Wildlife Refuge (ANWR). We particularly wish to express our appreciation to the committee members for proceeding with these important hearings.

The American Institute of Merchant Shipping (AIMS) is a national trade association representing 20 U.S.-flag shipping companies which own or operate approximately eight million deadweight tons of tankers, dry bulk carriers and other oceangoing vessels engaged in the domestic and international trades of the United States. As a representative of the vast majority of tankers involved in the carriage of crude oil from Alaska's North Slope (ANS), we strongly support S. 406 to authorize the Secretary of the Interior to lease, in an expeditious and environmentally sound manner, the public lands within the Coastal Plain of ANWR for oil and gas exploration, development, and production. Our statement concerns the positive impact this legislation would have on the U.S. maritime industry.

Opening up ANWR, Mr. Chairman, makes sense for the following cogent reasons:

(1) It would ensure secure energy supplies for the United States for the coming decades;

(2) It would provide shipbuilding work which is badly needed for United States shipyards;

(3) It would provide seamen's jobs;

(4) It would provide badly needed cargoes for U.S.-flag tankers as oil production declines on the Alaskan North Slope;

(5) It would provide jobs and revenue for the State of Alaska; and,

(6) It would provide work for U.S.-flag carriers serving Alaska such as Sea-Land, Crowley and Tote.

Presently, most of the crude oil tankers under the U.S.-flag are engaged in the transportation of ANS crude oil. This crude oil is produced from existing fields in Alaska's Prudhoe Bay Area, and delivered via the Trans-Alaskan Pipeline (TAPS), to Valdez, Alaska, where it is loaded onto tankers and transported to the lower 48 states. U.S.-flag vessels must be used in this trade in accordance with the Jones Act which reserves domestic waterborne commerce for U.S. documented vessels. There are currently 65 tankers in the "TAPS" trade.

On behalf of American tanker owners, we are proud of the outstanding environmental record established by our ships in transporting Alaska North Slope (ANS) crude oil to markets

on the mainland. We believe this record should be used in assessing the environmental impacts of the continued carriage of ANS crude and the carriage of ANWR oil when and if developed.

Set out below are some salient facts indicating the excellent safety and environmental record of petroleum transportation by U.S. tankers in the domestic trades.

- o The Port and Tanker Safety Act of 1978 has been implemented, requiring segregated ballast tanks, crude oil washing systems and inert gas systems on all tankers over 20,000 DWT, as well as numerous other improvements.

- o The reliability of shipboard equipment has been greatly improved in recent years with the advent of satellite-assisted navigation, improved radar, and redundant steering mechanisms.

- o The implementation of MARPOL '78 insures that discharges at sea do not occur and that adequate waste reception facilities are provided.

- o In three years (1981-1983), one of our largest operators lifted 45 million barrels of crude by tanker from Santa Barbara Channel spilling only one gallon.

o In the first seven years that the Trans-Alaskan Pipeline System (TAPS) was opened, tankers moved over three billion barrels of crude oil out of Valdez. Approximately 200 barrels have been spilled, which is equivalent to 67 barrels per billion barrels of oil shipped and a large portion of the amount spilled was recovered. No adverse environmental impact has been noted.

o Tankers have been transiting Santa Barbara Channel for well over 80 years. To our knowledge, no significant spills involving permanent environmental damage have occurred.

o One large oil company reports no spills since the inception (in the mid 1970's) of lightering operations in the U.S. Gulf from large (VLCC or ULCC) tankers to small tankers. Over 600 lighterings have occurred; these operations are far more difficult than loading from a single anchor leg mooring (SALM).

At present, there are somewhat less than 10 million DWT of tankers active under the U.S. flag. About 70% of these tankers are employed in the distribution of ANS crude. These tankers form a vital part of the merchant marine which the U.S. can call upon in time of war or national emergency

to carry petroleum products. Fortunately, the ANS crude market at this time is supporting these vessels and the manpower base necessary to run the ships.

However, as shown in the attached chart, when the production in the Prudhoe Bay oil fields declines, vessels will be forced out of this trade with little prospect of finding cargoes elsewhere. The vessels would be laid up and, unless there is a reasonable expectation of production in ANWR, most will be scrapped, which will result in an exacerbation of an already acute shortage of militarily useful tankers. We would add that lay up status does not guarantee that competent crews will be readily available if it becomes necessary to break the vessels out for an emergency. Approximately 50% of the tanker manpower base is found on the vessels transporting ANS crude. A commercial market which utilizes ships is the only guarantee that ships and men will be available when needed for the national defense. It is essential that Congress pass legislation to authorize leasing as soon as possible because oil production cannot take place for 10 to 15 years after leases are made. A continued use of the TAPS system by directing any oil found on the coastal plain into TAPS is a logical, environmentally sound method to proceed. TAPS and tankers have provided a safe method of transporting ANS crude and their use should be continued.

Other supporters of a decision to open the Arctic National Wildlife Refuge coastal plain to exploratory drilling and hopeful eventual development of oil fields will refer to the positive aspects of replacing the 25% of present domestic oil production represented by the Prudhoe Bay oil. To the considerable extent that this adds to the national security of the U.S., we add the very consequential benefits of keeping the major portion of the U.S. tanker fleet at work and available. This fleet operation provides major economic and national defense benefits for the United States.

In addition, supporters will show that oil can be produced on the Coastal Plain in an environmentally sound manner. I had the opportunity to visit the North Slope of Alaska and ANWR the summer before last. I was convinced, by observing the operations at Prudhoe Bay, that the technology available will ensure that no adverse effects to the ecology, environment, and wildlife will result from oil production within ANWR.

With respect to S. 406, we would like to make two brief comments. First, the positive impact that ANWR would provide for the U.S. maritime industry and our national energy security cannot be achieved unless the future oil production from ANWR is strictly reserved for domestic use. We see no reason to open ANWR solely for the benefit of foreign consumers. Therefore, we strongly urge that

language be included in the bill to ensure that any crude oil eventually produced within ANWR be reserved for domestic use. Second, we do not support the non-severability clause of section 503(d) and urge that it be removed. Obviously, this bill will provide substantial benefits to the State of Alaska, the U.S. maritime industry, and numerous other interested parties, including, we belive, the nation as a whole. However, the non-severability clause would have an inhibiting effect on a party wishing to exercise its Constitutional rights to seek redress of its perceived wrongs in our courts. Clearly, the revenue sharing provisions of the bill are secondary to the important decision to authorize leasing in ANWR. Furthermore, because of the uncertainty created by the clause, proceeding with leasing would be impractical until any legal challenges to the revenue sharing provisions had been finalized and appeals exhausted. This would significantly delay any production beyond the 10 to 15 years required for development and production after leases are made. Thus, we urge that the non-severability clause be removed from the bill.

The alternative to the development of ANWR is really unacceptable because, among other things, it would result in the idling and subsequent destruction of the existing infrastructure (tankers, the Trans-Alaskan Pipeline, etc.). This would be an unjustifiable waste in any circumstance,

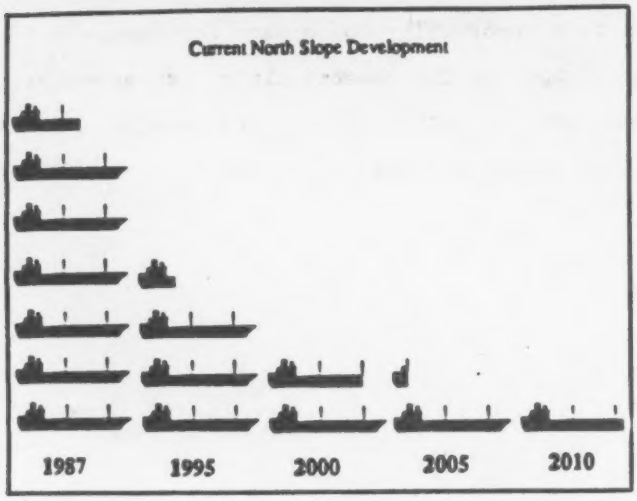
but especially in these days of emphasis on conservation of resources and on U.S. productivity.

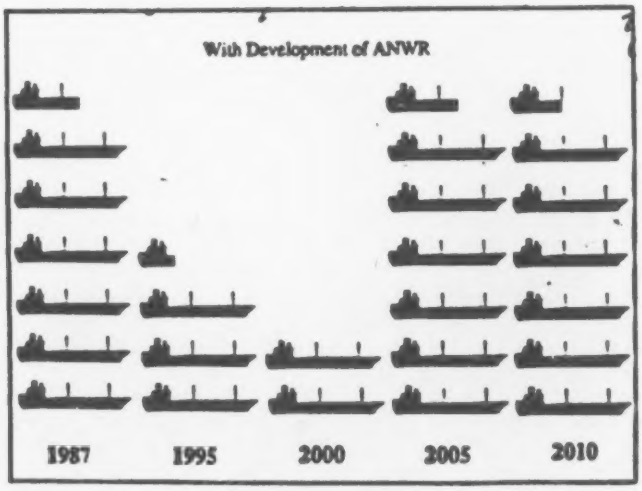
We appreciate this opportunity to comment for the record and strongly support opening the coastal plain, representing 1.5 million acres of the 19 million acre Arctic National Wildlife Refuge, to oil and gas development.

ATTACHMENT

CRUDE OIL TANKERS IN NORTH SLOPE TRADE

All tankers in North Slope Trade are U.S.-Flag Ships





represents 10 tankers in North Slope trade

Statement of

The Associated General Contractors of America

Presented to the

Committee on Energy and Natural Resources

United States Senate

on the Subject of

Oil and Gas Leasing in the

Arctic National Wildlife Refuge

S. 406

March 6, 1989

AGC is:

- More than 32,500 firms including 8,000 of America's leading general contracting firms responsible for the employment of 3,500,000-plus employees;
- 104 chapters nationwide;
- More than 80% of America's contract construction of commercial buildings, highways, industrial and municipal-utilities facilities.

The Associated General Contractors of America represents more than 32,500 firms, including 8,000 of America's leading general contracting companies which are responsible for the employment of more than 3,500,000 individuals. These member contractors perform more than 80 percent of America's contract construction of commercial buildings, highways, industrial and municipal-utilities facilities.

AGC is pleased to submit for the record, the following statement of the association's position in conjunction with current hearings on S. 406, a bill to authorize oil and gas leasing, exploration and development within the coastal plain of the Arctic National Wildlife Refuge (ANWR) in Alaska.

> AGC, by resolution adopted at its 68th Annual Convention, March 5-10, 1987, urged "that the Congress open the coastal plain of the ANWR to environmentally responsible oil and gas leasing, exploration, development and production."

The Arctic National Wildlife Refuge is a 19 million acre area on the Northeast coastal plain of Alaska. 65 miles to the west lie the Prudhoe Bay oil fields in Canada. 8 of the 19 million acres of ANWR are designated as wilderness. In 1980, Congress set aside 1.5 million acres of the refuge for further study of its resource and wilderness value. No oil activity was allowed pending completion of the study, and until Congress enacted legislation specifically authorizing the activity. The Department of the Interior was directed to make this in-depth study and submit its report within 5 years. In November 1986, the Department issued its draft report urging Congress to open this area to oil and gas operations under strict environmental guidelines.

On April 20, 1987, Interior Secretary Hodel released the final report on the hydrocarbon and wildlife resources of the coastal plain. The Department's projections deal with major oil and gas fields and potential reserves which rival, perhaps even exceed those of Prudhoe Bay, the nation's largest oil discovery. The study concludes that the coastal plain of ANWR may be the most outstanding oil and gas frontier remaining in the United States and recommends that the entire 1.5 million acre area be opened for oil and gas leasing, under prudent environmental regulations.

Currently, Prudhoe Bay and Alaska's North Slope provide more than 20 percent of the nation's total domestic crude oil production. These resources are now in significant decline and are not being replaced. The 1.5 million acre coastal plain has the potential for enabling Alaska's North Slope to continue to provide a major alternative to imported oil and a very substantial contribution to national petroleum needs.

National energy forecasters now predict that oil imports may increase from the current 35 percent of the U.S. market to 50 percent by the 1990s. U.S. imports from the volatile Persian Gulf area increased 300 percent in 1986 and accounted for more than half the total increase in imports that year.

At the same time, production from current U.S. reserves is expected to decline considerably from the present 8 million barrels of oil per day to less than 3 million in the late 1990s. To compensate for this loss of production, new discoveries of domestic oil must be developed or imports will have to be increased. Much of this decline will be attributable to decreased Prudhoe Bay production, which in 1986 averaged 1.5 million barrels-per-day but will fall to 280,000 barrels-per-day by the year 2000.

It is anticipated that the earliest ANWR production could begin is 1998 to 2000 -- even if Congress approves exploration today. By 2000, because of the Prudhoe Bay decline, the Trans-Alaska Pipeline System will be operating at 25 percent of its 2 million barrel-per-day capacity. ANWR development would fully utilize the pipeline and deliver critical domestic oil.

The need for orderly domestic oil and gas development has been clearly demonstrated. Also amply demonstrated is the fact that the development can be done in a way to protect the environment and wildlife.

Numerous laws and regulations assure that oil and gas activities can protect the surrounding environment. Experience in Alaska and the lower 48 states shows that oil and gas activities are consistent with other goals such as wildlife protection. Nearly 20 years of experience on the North Slope demonstrates that helping to meet the nation's energy needs and protecting our wildlife and environment are functions that can coexist to the benefit of all. Techniques employed to minimize disturbance include directional drilling, smaller and consolidated facilities, winter construction, use of temporary ice roads, special arctic equipment and elevated pipelines and facilities.

Because of extremely long lead times needed to bring oil fields into production in the arctic, it is important that Congress move expeditiously to enact legislation to permit oil and gas exploration and development of the Arctic National Wildlife Refuge in an environmentally responsible manner.

Despite this strong support for the development of oil and gas resources in the Arctic National Wildlife Refuge, AGC is deeply concerned about a provision, the so-called Manton Amendment, which was added to similar legislation in the 100th Congress by the House Merchant Marine and Fisheries Committee. If a similar provision were included in S.406 AGC would be compelled to oppose passage of the legislation.

The Manton amendment would require contractors and subcontractors who perform construction and maintenance work on ANWR projects to pay local union wages and fringe benefit rates even where a collective bargaining relationship has not been established between the contractor and its employees. The provision would also, by incorporation, require contractors to follow costly and unproductive union work rules and craft jurisdictions and force non-union construction workers to join unions as a condition of employment.

This language would establish the precedent that organized labor has the right to exercise monopolistic control over the wages, fringe benefits and other employer compensation on private sector construction projects. If Congress gives this right to organized labor in Alaska, it will establish a precedent for giving organized labor the same right in every state. AGC does not believe Congress should give this monopolistic right and privilege to any special interest group.

AGC urges this committee and the Congress to move expeditiously in passing legislation to open ANWR to oil and gas exploration. It clearly should be a national priority. Our national security and independence could be significantly impacted if action is not taken promptly. AGC urges this committee to not risk enactment of this vital legislation by including this special interest provision.

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

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JAMES W. SUPICA, *President* PAUL EMERICK, *Senior Vice President* KIRK FORDICE, *Vice President*

RICHARD E. FORRESTEL, *Treasurer* HUBERT BEATTY, *Executive Vice President*

March 6, 1989

The Honorable J. Bennett Johnston
Chairman
Committee on Energy and Natural Resources
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The Associated General Contractors of America is pleased to submit for the record, the attached statement of the association's position in conjunction with the Committee's hearing on S. 406, a bill to authorize oil and gas leasing, exploration and development within the coastal plain of the Arctic National Wildlife Refuge (ANWR) in Alaska.

Thank you for the opportunity to present our views.

Sincerely,

Heidi H. Stirrup
Director
Congressional Relations
Procurement

HHS/gh

Bristol Bay Native Corporation
900 CORDOVA / P.O. BOX 100220 / ANCHORAGE, ALASKA 99510 / (907) 278-3602
TELECOPY (907) 278-3614

March 6, 1989

MEMORANDUM

To: Tom Williams and Beth Norcass

From: Jon DeVore, Assistant General Counsel for the Bristol Bay Native Corporation

Attached is the testimony of the 7(i) Coalition on the ANWR legislation. The Coalition respectfully requests that you include the testimony and the attached addendum in the record of the March 6, 1989 hearing on ANWR.

If you have any questions, please call our local counsel, Tom Mills, at 944-3000.

TESTIMONY OF BRISTOL BAY NATIVE CORPORATION,
THE ALEUT CORPORATION AND NANA REGIONAL CORPORATION, INC.

Mr. Chairman, members of the Senate Energy and Natural Resources Committee, the 7(i) Coalition (made up of the Bristol Bay Corp., The Aleut Corp., NANA Regional Corp., Inc. (including 10 merged Village corporations), the Calista Corp., the Chugach Alaska Corp., Ahtna, Inc. (including 7 merged Village corporations), Chitina Village Corp., Tanadgusix Corp., Unalakleet Native Corp., Sitnasuak Native Corp., Bethel Native Corp., Kuskokwim Corp. (including 10 merged Village corporations), St. Mary's Village Corp., Eyak Corp., Ouzinkie Corp., Kikiktagruk Inupiat Corp. (Kotzebue), Bristol Bay Native Association (representing 30 traditional Village councils), Alaska Peninsula Corp. (including 5 merged Village corporations), Aleknagik Native Limited, Becharof Corporation, Choggiung Limited (including 3 merged Village corporations), Ekwok Natives Limited, Far West, Inc., Koliganek Natives Limited, Manokotak Natives Limited, Oceanside Corp., Inc., Paug-Vik Limited, Stuyahok, Limited, Togiak Natives Limited, Igiugig Native Corp., Pedro Bay Native Corp., Pilot Point Native Corp., Bay View, Inc., Olsonville, Inc., Iliamna Natives Limited, Saguyak, Inc., Chignik Lagoon Corp., and Chignik River, Limited) thank you for the opportunity to submit testimony on the issue of opening the Artic National Wildlife Refuge to exploration and development of oil resources.[1] The corporations submitting this testimony are Alaska Native Corporations formed pursuant to the terms of the Alaska Native Claims Settlement Act.

As Alaskans and as Native Corporations, the Coalition supports the opening of ANWR. Both the nation and the State of Alaska will benefit greatly from legislation which will permit the exploration and development of the oil and gas potential of the Arctic National Wildlife Range Coastal Plain in a sound and reasonable manner. During the course of the hearings, a number of issues have been raised regarding the details of such legislation. It is our understanding that the Committee is seeking detailed comments on how to draft legislation to permit exploration and development in the Coastal Plain. This testimony will provide such comments on an issue which at this point has not been discussed by the Committee.

Background and History

As the Committee is aware, the passage of legislation to provide for the exploration and development of the Coastal Plain will also permit the development of private lands owned by the Arctic Slope Regional Corporation (ASRC). These lands were obtained by

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[1]Attached is an addendum which lists the merged Village corporations mentioned but not enumerated in this testimony.

ASRC in 1983. Under Section 1431(o) of the Alaska National Interest Lands Conservation Act (ANILCA), ASRC had an option to acquire subsurface in ANWR for other subsurface owned by ASRC if ANWR were opened for development. In 1983, ASRC was allowed to accelerate these option rights in the subsurface estate north of the Coastal Plain near the village of Kaktovik in exchange for interests in 92,160 acres of land at Chandler Lake in the Gates of the Artic National Park.

Because ASRC attempted to structure the land trade as an ASRC surface estate for federal subsurface estate exchange, ASRC takes the position that the ASRC subsurface lands at Kaktovik are not subject to the normal provisions of Section 7(i) of the Alaska Native Claims Settlement Act (ANCSA). That section provides that regional corporation subsurface land is subject to a revenue sharing provision which privides for the allocation of revenue from subsurface lands among all 12 regions. Under Section 7(j) of ANCSA, fifty percent of the 7(i) revenues distributed to all 12 regional corporations must be redistributed to the over 200 village corporations and to the "at-large" shareholders who are not members of village corporations.

The Coalition in this testimony believes that ASRC lands at Kaktovik must be subject to sharing. If they were not, a key element of the Congressional framework of ANCSA would be defeated and the potentially single-most valuable subsurface land owned by a regional corporation would escape the basic rules of ANCSA requiring sharing.

A description of the policy behind sharing and how it should apply to ASRC lands follows. Because Congress understood that resources which should be developed for the economic benefit of Alaska Natives were not uniformly spread throughout the state, it provided for a revenue sharing mechanism in Section 7(i) of ANCSA. That revenue sharing mechanism states as follows:

> "7(i) 70 percent of all revenues by each regional corporation from the timber resources and subsurface estate patented to or pursuant to this act shall be divided annually by the regional corporations among all 12 regional corporations organized pursuant to this section, according to the number of natives enrolled in each region pursuant to Section 5. The provisions of this subsection shall not apply to the 13th regional corporation of organized pursuant to subsection (c) hereof." (Emphasis supplied)

Under Section 7(i), revenues from subsurface resources held by a regional corporation must be shared among all regions. Section 7(i) we intended to achieve "a rough equality in assets among all Natives" by insuring that all Natives benefit in roughly equal proportions from subsurface assets. Alet Corp. v. Artic Slope Regional Corp., 421 F. Supp. 862, 867 D. Alaska 1976; Chugach Natives Inc. v. Doyon, Ltd., 588 F.2d 723, 732 (9th Cir. 1978).

Under the normal selection procedure of ANCSA, regional corporations obtain the subsurface underneath village surface selections. In this case, the Kaktovik Village received the right to select 92,160 acres of village land. However, Section 12 (f) of ANCSA excluded this regional subsurface selection within wildlife refuges existing in 1971. These included the Arctic National Wildlife Range (ANWR). IN 1980, Congress provided that if ANWR were open to exploration and development, the ASRC would be permitted to exchange, on an acre for acre basis, lands which it was forced to select in lieu of lands under the Kaktovik surface for the subsurface at Kaktovik. That provision, section 1431(o) of ANILCA provided as follows:

> "(o) Future Option to Exchange, etc.--(1) whenever, at any time within 40 years after the date of the enactment of this act, public lands in the... Arctic National Wildlife Range, within 75 miles of land selected by a village corporation pursuant to the provisions of section 12(a)(1) of the Alaska Native Claims Settlement Act are open for purposes of commercial development (rather than exploration) of oil or gas, Artic Slope Regional Corporation shall be entitled, at its option, within five years of the day of its opening to consolidate lands by exchanging in lieu subsurface lands for which its selected pursuant to the provisions of section 12 (a)(1) of the act for the equal acreage of the subsurface estate identified by Arctic Slope regional corporation, beneath the land selected by the village corporation..." (43 USC 1611)

Thus Congress established a policy that if ANWR were to be opened by the Congress for development ASRC would be allowed to obtain ownership of lands under the Kaktovik Village as if the originial prescription on selection had not occurred under all the terms of ANCSA including Section 7(i). This was in recognition of the theory that Alaska's Natives should be allowed to share in any development of ANWR based on the normal terms of the Alaska Native Claims Settlement Act. This was a good and sound provision, particularly in light of the fact that not just the shareholders of ASRC would benefit but all Alaska Native shareholders under ANCSA would benefit because of the 7(i) revenue sharing provisions.

Structure of 1984 Land Exchange Designed To Defeat the 7(i) Revenue Sharing Provisions.

However, the Arctic Slope Regional Corporation has attempted to circumvent the 7(i) sharing process by characterizing its land exchange as a "surface for subsurface exchange." The corporations submitting this testimony disagree with this position in the strongest possible terms and believe that Congress intended that ASRC, as all other regional corporations, should be required to share all revenues it receives under the terms of Section 7(i).

It is a matter of record that ASRC has received over $24 million from private companies to explore the lands which it owns. An exploration well has been drilled and other monies, including royalties, would be owed to ASRC if the area is opened to development and ASRC is permitted to develop its lands. All of this money should be subject to 7(i) revenue sharing, but ASRC has refused to share.

The current state of the ASRC land exchanges is intolerable for all Alaska Natives because of the threat to dismantle Section 7(i). As ASRC testified to the House Committee on the Interior and Insular Affairs on June 10, 1988, ASRC's exchange was structured to attempt to circumvent provisions of Section 7(i) by pruporting to exchange surface for federal subsurface in ANWR. However, within a year after conveying the surface estate and other subsurface interests at Chandler Lake, ASRC traded out the remainder of its subsurface interests with the result that the federal government ended up acquiring all of the surface and subsurface at Chandler Lake. If the traditional federal policy of exchanging for the entire fee estate, if available, as it is in most cases and as it certainly was in the ASRC exchange, were applied then the provisions of Section 7(i) would provide automatically for sharing. Instead, this trade of an artificially split estate is an aberration from ordinary government exchange policy, and has created a rift in the Alaska Native community. The corporations providing this testimony urge that the Department of Interior return to its policy of acquiring the fee in any proposed land trades, as a matter of good public policy and to insure Section 7(i) sharing.

Request that Congress Act to Affirm Sharing Under Section 7(i)

The Congress should provide for the opening of ANWR and for the exploration and development of the ASRC subsurface lands at Kaktovik. However, Congress should only provide for the exploration and development of the ASRC lands under the terms and conditions of Section 7(i). In other words, it should attach a condition to its opening of the ASRC lands. The ASRC lands cannot be opened without the agreement of Congress. The terms and conditions of the trade provide that the land can only be opened for full exploration and development if Congress agrees by opening ANWR generally to exploration. Consequently, ASRC requires Congressional approval for its exploration. That approval should be provided only upon condition that ASRC agree to abide by the Congressional policy established in 1971 under ANCSA and reaffirmed in 1980 under ANILCA that all Alaska Natives should be permitted to share in the economic benefit of scarce subsurface resources which are not uniformly scattered throughout the state. The parties submitting this testimony strongly urge the Congress to provide for such 7(i) sharing by ASRC as part of its draft Committee bill to ensure that all Alaska Natives are fairly treated and continue to support the opening of ANWR for the benefit of Alaska and the Nation.

Other Issues

In testimony before the House Committee on Interior and Insular Affairs last year, ASRC maintained that the 7(i) Coalition's proposed amendment would result in taking of property in violation of the Fifth Amendment of the U.S. Constitution. ASRC's submitted statement to this Committee dated November 11, 1987 is attached. This argument is absolutley incorrect. The response by the Calista Corporation, Chugach Alaska Corporation, NANA Regional Corporation, BBNC, The Aluet Corp., & Ahtna, Inc. dated Jan. 18, 1988 is also submitted for the record.

In order for there to be a compensable taking, ASRC must have something to take. ASRC can receive no future revenues form the developement of it ANWR subsurface estate until the restrictions of Section 1003 of ANILCA prohibiting development in ANWR are lifted. Any future ANWR legislation will serve only to increase its current value and revenue producing capability. In deciding whether to lift these restrictions, the Congress is free to consider and act on factors relevant to any of its legitimate constitutional powers, including its plenary authority over public lands and Indian affairs and its continuing oversight of the manner in which ANCSA is administered. For instance, if Congress restricted exploration activities in ANWR during certatin periods ASRC could not complain of a taking. Congress has ample power to impose conditions upon the granting of that new benefit. The Coalition has attached a more extensive legal memorandum on the taking issue for inclusion in the record.

The 7(i) Coalition carefully crafted the proposed amendment with the specific intent to avoid any retroactive effect. The $24 million already paid to ASRC by the oil companies for exploration rights is not covered by the amendment, including $929,680 received in annual lease payments because the amendment would be effective on the day the public law is enacted.

The Committee should also be aware that some members of the Coalition are currently involved in an arbitration proceeding over the $24 million in bonus payments and the $929,680 annual lease revenues pursuant to the 7(i) Settlement Agreement. The Coalition wishes to stress that the arbitration may not resolve the fundemental question of whether future revenues will be shared by ASRC. Should oil and gas be discovered on ASRC lands and ASRC continue to disregard its sharing obligations, the other regional corporations will be forced into arbitration for every year that ASRC receives revenue from the subsurface. These arbitrations could continue through production regardless of the outcome of the current arbitration. They could happen because revenue and costs are reported annually and each arbitration resolves disputes over costs and revenues for a particular fiscal year. Under the arbitration contract the arbitrators are required to consider but are not required to be bound by previous arbitrations.

Conclusion

ASRC's refusal to share its ANWR-related revenues is threatening to erode the very foundations of ANCSA. This is an outrageous circumvention of the intent of the Congress that all Alaska Natives be treated fairly in exchange for the extinguishment of their aboriginal claims. The Senate Energy Committee can end this debate and correct the grave injustice perpetrated on all Alaska Natives by ASRC by adopting the 7(i) Coalition's proposed amendment.

ADDENDUM: FOOTNOTE 1

LIST OF MERGED VILLAGE CORPORATIONS

NANA Regional Corporation

1. Ivisaapaagmiit Corp. (Ambler)
2. Nunachiak Corp. (Buckland)
3. Deering Ipnatchiak Corp. (Deering)
4. Katyaak Corp. (Kiana)
5. Kivalina Sinuakmeut Corp (Kivalina)
6. Koovukmeut, Inc. (Kobuk)
7. Noatak Napaaktukmeut Corp. (Noatak)
8. Putoo Corp. (Noorvik)
9. Akuliuk, Inc. (Selawik)
10. Isingnakmeut, Inc. (Shungnak)

Ahtna, Inc.

1. Cantwell Yedetena Native Corp. (Cantwell)
2. Cheesh-na, Inc. (Chistechina)
3. Kluti-Kaah Corp. (Copper Center)
4. Gakona Corp. (Gakona)
5. Sta-Keh Corp. (Gulkanna)
6. Mentasta, Inc. (Mentasta Lake)
7. Tazilina, Inc. (Tazilina)

Kuskokwim Corp.

1. Stony River, Ltd (Stony River)
2. Sleetmute, Ltd. (Sleetmute)
3. Kipchaughpuk, Inc. (Crooked Creek)
4. Aniak, Ltd. (Aniak)
5. Chuathbaluk Company (Chuathbaluk)
6. Georgetown, Inc. (Georgetown)
7. Lower Kalskag, Inc. (Lower Kalskag)
8. Kalskag, Inc. (Kalskag)
9. Napaimute, Ltd. (Napaimute)
10. Red Devil, Inc. (Red Devil)

Alaska Peninsula Corp.

1. Kokhanok
2. Newhalen
3. Port Heiden
4. South Naknek
5. Ugashik

Choggiung, Ltd.

1. Dillingham
2. Ekuk
3. Portage Creek

U.S. Chamber of Commerce

1615 H Street, N.W.
Washington, D.C. 20062
202/463-5602

Albert D. Bourland
Vice President
Congressional Relations

March 3, 1989

The Honorable J. Bennett Johnston
Chairman
Committee on Energy and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

Enclosed is a statement expressing the views of the U.S. Chamber of Commerce on S. 406, the "Arctic Coastal Plain Competitive Oil and Gas Leasing Act."

The Chamber appreciates your consideration of its views and requests that they be made a part of the hearing record.

Sincerely,

Albert D. Bourland

Enclosure

cc: Committee Members
Daryl Owen, Staff Director
Frank Cushing, Minority Staff Director

Statement of the U.S. Chamber of Commerce

ON: THE ARCTIC COASTAL PLAIN COMPETITIVE OIL AND GAS LEASING ACT

TO: SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

BY: SUSAN C. MOYA

DATE: MARCH 6, 1989

The Chamber's mission is to advance human progress through an economic, political and social system based on individual freedom, incentive, initiative, opportunity and responsibility.

The U.S. Chamber of Commerce is the world's largest federation of business companies and associations and is the principal spokesman for the American business community. It represents nearly 180,000 businesses and organizations, such as local/state chambers of commerce and trade/professional associations.

More than 92 percent of the Chamber's members are small business firms with fewer than 100 employees, 59 percent with fewer than 10 employees. Yet, virtually all of the nation's largest companies are also active members. We are particularly cognizant of the problems of smaller businesses, as well as issues facing the business community at large.

Besides representing a cross section of the American business community in terms of number of employees, the Chamber represents a wide management spectrum by type of business and location. Each major classification of American business--manufacturing, retailing, services, construction, wholesaling, and finance--numbers more than 10,000 members. Yet no one group constitutes as much as 32 percent of the total membership. Further, the Chamber has substantial membership in all 50 states.

The Chamber's international reach is substantial as well. It believes that global interdependence provides an opportunity, not a threat. In addition to the 59 American Chambers of Commerce Abroad, an increasing number of members are engaged in the export and import of both goods and services and have ongoing investment activities. The Chamber favors strengthened international competitiveness and opposes artificial U.S. and foreign barriers to international business.

Positions on national issues are developed by a cross section of its members serving on committees, subcommittees and task forces. Currently, some 1,800 business people participate in this process.

STATEMENT
on
THE ARCTIC COASTAL PLAIN COMPETITIVE OIL AND GAS LEASING ACT
for submission to the
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
by
Susan C. Moya*
March 6, 1989

The U.S. Chamber of Commerce, the world's largest federation of businesses, state and local chambers of commerce, and trade and professional associations, appreciates this opportunity to express its support for S. 406, the Arctic Coastal Plain Competitive Oil and Gas Leasing Act, which authorizes an orderly oil and gas leasing program for the Coastal Plain of the Arctic National Wildlife Refuge (ANWR) under strict environmental standards.

The U.S. needs the oil believed by geologists to be contained in the Coastal Plain despite any heightened efforts to conserve energy, use it more efficiently, and explore alternatives, such as wind power, solar collectors, and photovoltaic cells. Without additional domestic supplies, such as those believed to be contained in the Coastal Plain, the U.S. would be forced to increase oil imports, resulting in an increase in the U.S. trade deficit, lost job opportunities, and life-style changes.

The Chamber supports oil and gas development in the Coastal Plain and appropriate environmental safeguards. S. 406 meets both of the Chamber's requirements. It authorizes a leasing program, but at a pace and under circumstances that will avoid unnecessary adverse effects on the environment.

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*Susan C. Moya is Manager, Energy and Natural Resources Policy.

The Chamber believes that the potential oil and gas resources of the Coastal Plain are critical to the health, vitality, and national security of the country (see appendix). It also believes that oil and gas development, as provided in S. 406, can be compatible with the fragile Arctic ecosystem. The bill's environmental safeguards deserve special emphasis and will be the focus of the Chamber's comments.

S. 406 Provides Stringent Environmental Protection

It cannot be overemphasized that human use of the Coastal Plain's resources must not be allowed to diminish its aesthetic and refuge values. The Chamber believes that S. 406 would accomplish this important goal, because it:

- Restricts to 300,000 acres the total acreage per lease sale that the Secretary of the Interior may offer and provides for the exclusion of particularly environmentally sensitive areas.
- Mandates reclamation to a condition as closely approximating the original condition as feasible and establishes a $50 million reclamation fund for use in reclaiming the Coastal Plain and other North Slope lands. Leaseholders are made fully responsible and liable for the reclamation of lands in connection with exploration, development, or transportation activities.

- o Provides that the Secretary must, through regulations, lease terms, conditions, restrictions, prohibitions, and stipulations, ensure that oil and gas exploration, development, and production activities on the Coastal Plain result in "no significant adverse effect on fish and wildlife, their habitat, and the environment." The bill also requires that the "best commercially available technology" be applied to all new operations and, whenever practicable, on existing operations.
- o Requires that exploration, development, and production be undertaken in a manner consistent with the interests of the area's subsistence users.
- o Imposes seasonal limitations on exploration, development, and related activities, where necessary, to avoid significant adverse effects during periods of concentrated fish and wildlife breeding, denning, nesting, spawning, and migration. The bill also stipulates that exploration activities, excluding surface geological studies, be limited to between approximately November 1 and May 1 every year and that such exploration activities be supported by ice roads, winter trails with adequate snow cover, ice pads, ice airstrips, and air transport methods.
- o Ensures that a significant portion of ANWR revenues are available for several important conservation programs and for wetlands protection, acquisition, and restoration.

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The Chamber recognizes that developing the Coastal Plain could have some environmental consequences and would eliminate the "wilderness" character of that area. However, much has been learned from development at Prudhoe Bay, and the evidence has shown that petroleum operations can be compatible with the conservation of the land's natural values. Experience in other wildlife refuges has also shown such compatibility.

A survey of oil and gas activities in 43 refuges in the contiguous 48 states, including 19 refuges with oil and/or gas production, found that oil and gas operations had little or no adverse effects on refuge wildlife or on other economic or recreational uses. This has also been true in Alaska in the Kenai National Wildlife Refuge and in sensitive areas of the North Slope.

Conclusion

Opening the Coastal Plain for oil and gas leasing is important to help ensure that dependable future supplies of energy will be available for homes, farms, factories, and transportation and for strengthening the national economy, increasing federal revenues, providing jobs, and lowering the U.S. trade deficit. But the development of this area must be consistent with the protection of fish and wildlife, their habitat, and the environment.

The Chamber believes that S. 406 strikes a sound balance between developing energy in the Coastal Plain and ensuring a wildlife legacy for the future. It urges the Committee promptly to report S. 406.

At Issue

Resources Policy Department

U. S. Chamber of Commerce, Washington, D.C. 20062

The Need for ANWR Development

Events in the Persian Gulf demonstrate the danger of dependence on oil from unstable sources. To lessen its dependence, the U.S. must explore for and develop its own energy resources, until alternative fuels become economically available. At a time when domestic production is at a twenty-five-year low, imports are at their highest levels since 1979 and significantly higher than at the start of the 1973-74 Arab oil embargo, and the demand for oil and gas is increasing, the nation's energy policy must include domestic energy production.

It is generally agreed that the 1.5 million-acre Coastal Plain contains the nation's most promising onshore frontier for major oil and gas prospects. Although expert opinion is divided over the size of the Coastal Plain's petroleum resources, the Department of the Interior concluded that the Coastal Plain could contain as much as 9.2 billion barrels of economically recoverable oil, putting the area on a par with Prudhoe Bay, the largest U.S. discovery to date. Estimates of the size of the reserves can not be confirmed without Congressional approval of exploration.

Because of the 10- to 15-year lead time required for oil and gas development in the Arctic, Congress must now encourage, with appropriate environmental safeguards, oil production on all of the most promising federal lands, particularly the Coastal Plain area. By leasing the Coastal Plain now, oil could come on line just as production from Prudhoe Bay, which provides more than 20 percent of U.S. domestic oil production, is declining. By waiting for the next oil shock before acting to bolster domestic production, the U.S. increases the environmental risk for ANWR, as well as the risks to economic and national security. Authorizing the leasing of the Coastal Plain for oil and gas exploration and development could become America's insurance policy.

The additional energy production sought through a Coastal Plain leasing program is a necessary complement to, not a substitute for, additional conservation and alternative energy research efforts. Impressive energy conservation and efficiency gains have been made, but the Department of Energy (DOE) predicts that further efficiency gains will largely affect electricity and natural gas, not oil. Thus, oil will continue to be an essential fuel for the U.S. and the world for the foreseeable future.

Key projections in a March of 1987 interagency study prepared by the DOE, at the President's request, entitled Energy Security: A Report to the President of the United States, show U.S. oil imports increasing from 5.2 million barrels per day in 1986 to between 8 million and 10 million barrels per day in the 1990's. In other words, oil imports will increase from about one-third of U.S. consumption to about one-half of projected consumption in the decade beginning only nine months from now.

The National Petroleum Council (NPC) in its report entitled U.S. Oil and Gas Outlook presented the U.S. near-term and longer-term oil import situation as going from gray to "utterly black." The NPC study projects even higher oil import figures than the DOE report. Depending upon whether future prices follow a relatively low or a relatively high path, the acceleration in the decline of future domestic production, accompanied by even moderate increases in consumption, could result in imports of 35 percent to 50 percent of consumption by 1990, 45 percent to 60 percent by 1995, and 50 percent to 70 percent by the year 2000.

To put the DOE and NPC figures in perspective, when the Arab oil embargo began in 1973, the U.S. was importing about one-third of its oil -- approximately six million barrels per day. Despite drastic increases in oil costs, imports continued to rise to almost 10 million barrels per day by early 1977. After that, oil imports gradually declined to less than four million barrels per day by early 1983. Since that time, however, imports have surged; and today the U.S. is importing more than 42 percent of its oil requirements.

With oil imports expected to reach 50 percent of consumption by the mid-1990's, U.S. oil requirements and domestic production projections are especially alarming and require close attention.

Also troublesome to the Chamber is that American oil reserves, resources that have been located with considerable certainty and that can be economically recovered with present technology, have been steadily shrinking. By 1990 these are estimated to reach the lowest levels since shortly after World War II. Yet, three-quarters of the oil that the U.S. must have in the year 2000 -- just 11 years from now -- still has to be found.

Since the U.S. began drilling for oil more than a century ago, it has produced about 50 percent of the estimated onshore oil and gas reserves and 20 percent of the estimated offshore reserves. Although America's Outer Continental Shelf (OCS), those lands beyond the three-mile state boundary, holds great promise, only 15 percent of all offshore drilling exploration wells have been successful. Because of this limited success, knowing what the potential oil and gas resources are in the Coastal Plain of the ANWR is more important than ever.

The importance of the Organization of Petroleum Exporting Countries (OPEC) again is increasing; oil imports from the Middle East tripled in 1986 and rose again last year. Without substantial new domestic discoveries, the nation's dependence on OPEC will continue to rise, placing the U.S. in a precarious energy security position -- subject to extreme price fluctuations and supply disruptions. Production from the Prudhoe Bay field in Alaska, which currently provides about 20 percent of domestically produced oil supplies, is expected to peak soon and start to decline. And production from the North Sea and other non-communist, non-OPEC sources cannot offset the U.S. production decline. The Chamber believes that the OCS and the

Coastal Plain area of ANWR now offer the best chance of yielding large new oil and gas fields. The alternative, increased oil imports, would cost needless billions of dollars and increase U.S. reliance on OPEC.

In 1987, the U.S. spent over $45 billion on imports of crude oil and petroleum products. If the U.S. eliminated these imports, its balance of trade deficit could be reduced substantially — by more than 25 percent in 1987. As long as the U.S. continues to import oil, it continues to export dollars and jobs.

MANUFACTURING CREATES AMERICA'S STRENGTH

STATEMENT SUBMITTED

BY THE

NATIONAL ASSOCIATION OF MANUFACTURERS

BEFORE THE

U.S. SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

IN SUPPORT OF

S. 406, "THE ARCTIC COASTAL PLAIN

COMPETITIVE OIL AND GAS LEASING ACT"

MARCH 6, 1989

National Association of Manufacturers
1331 Pennsylvania Avenue, NW, Suite 1500 — North Lobby
Washington, DC 20004-1703 (202) 637-3000

The National Association of Manufacturers is a voluntary business association of more than 13,500 member companies and subsidiaries, large and small, located in every state. Members range in size from the very large to the more than 9,000 smaller manufacturing firms, each with fewer than 500 employees. NAM member companies employ 85 percent of all workers in manufacturing and produce more than 80 percent of the nation's manufactured goods. NAM is affiliated with an additional 158,000 businesses through its Associations Council and the National Industrial Council.

EXECUTIVE SUMMARY

This statement is submitted on behalf of the National Association of Manufacturers (NAM), in support of S. 406, the Arctic Coastal Plain Competitive Oil and Gas Leasing Act. The association's interest in the development of energy resources of the Coastal Plain of Alaska's Arctic National Wildlife Refuge (ANWR) stems from the concern that its members, and all consumers have for a stable supply of energy resources. As Members of Congress realize, energy is an important component of manufacturing because of costs and the availability of energy products as feedstocks. Sudden price shocks or curtailments due to dependence upon unreliable energy sources have a devastating effect on our industrial base, our economy, and our ability to maintain our standard of living.

The proposed exploration and development of a small, but promising portion of the Arctic National Wildlife Refuge must be taken in the context of America's energy policy. We understand that a good energy policy should be a balanced mix of available energy sources coupled with energy efficiency or conservation. But it must be a mix and should not preclude exploration for oil and gas reserves.

For a variety of reasons, oil prices collapsed in 1986, resulting in a collapse in domestic oil drilling. This increased the Nation's vulnerability to future energy embargoes as our imports from the Middle East have quadrupled. By October of 1988, 43 percent of U.S. demand for oil was fulfilled by imports. It is estimated that if the December 1988 production level is maintained throughout 1989, domestic oil production will be the lowest in a quarter of a century. As Americans, we are concerned about these trends. We remember the long gasoline lines during past embargoes. We remember our factories forced to close or slow-down due to inadequate energy supplies. We remember our employees laid off--too many ultimately losing their jobs due to foreign competitors. This is not a history we want to repeat. Given this history, NAM believes that the U.S. petroleum industry must have the ability to explore and produce new sources of oil in an environmentally sound manner. The Department of Interior has described the Coastal Plain of ANWR as the nation's "best single opportunity to increase significantly domestic oil production."

It has been estimated that development of ANWR could yield a net national economic benefit of more than $300 billion. These benefits would be manifested in new jobs, lower balance of trade deficits and increased tax revenues to all government levels. These and other economic benefits would reach all 50 states. For example, since 1974, oil companies developing North Slope fields have pumped more than $36 billion into business in all 50 states. And this figure since 1980 alone is estimated to be over $10 billion. As a result, development of an Alaskan resource is not just an Alaskan benefit: the State and Federal governments benefit from increased royalty collections; the consumer benefits from more stable prices; our national security is enhanced by more dependable sources of supply; manufacturing in every state benefits by supplying equipment, rigs, pipe steel and instruments; and thousands of new jobs are created nationwide to service and supply the oil industries.

NAM member companies are concerned about the environment, but we are also concerned about our economic and national security. We do believe that oil and gas production on a small portion of ANWR's Coastal Plain can be done in an environmentally safe manner. If approval is given now, the lead time before any production would begin would be well over 10 years. Imported oil is the largest component of our trade deficit. Our reliance on unsure sources of oil dictate foreign policy options, such as military presences, which this country may otherwise not choose to follow. We must approve S. 406 now.

STATEMENT SUBMITTED

BY THE

NATIONAL ASSOCIATION OF MANUFACTURERS

BEFORE THE

U.S. SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

IN SUPPORT OF

S. 406, "THE ARCTIC COASTAL PLAIN

COMPETITIVE OIL AND GAS LEASING ACT"

MARCH 6, 1989

This statement is submitted on behalf of the National Association of Manufacturers (NAM), in support of S. 406, the Arctic Coastal Plain Competitive Oil and Gas Leasing Act.

The association's interest in the development of energy resources of the Coastal Plain of Alaska's Arctic National Wildlife Refuge (ANWR) stems from the concern that its members, and all consumers have for a stable supply of energy resources. As Members of Congress realize, energy is an important component of manufacturing because of costs and the availability of energy products as feedstocks. Sudden price shocks or curtailments due to dependence upon unreliable energy sources have a devastating effect on our industrial base, our economy, and our ability to maintain our standard of living.

The proposed exploration and development of a small, but promising portion of the Arctic National Wildlife Refuge must be taken in the context of America's energy policy.

We understand that a good energy policy should be a balanced mix of available energy sources coupled with energy efficiency or conservation. But it must be a mix and should not preclude exploration for oil and gas reserves. The U.S. was self-sufficient in oil until the end of World War Two. Beginning in the 1950s, the country became hooked on cheap Middle Eastern oil, with import dependency rising until it exceeded 40 percent in the 1970s. In 1970, U.S. oil production peaked and began to decline; during this period, Saudi Arabia became the largest world oil producer. The effectiveness of the oil embargoes of 1973 and 1979 was the result of these trends.

The successive OPEC shocks of the 1970's had substantial adverse effects on the economy, both by raising the price level and depressing output. The proximate effect of the increase in energy prices was to raise domestic inflation rates while lowering GNP through the trade deficit. In order to prevent the prices from being fully transmitted to the underlying rate of inflation, central banks responded with monetary restraint, throwing the economies of the oil-consuming countries into recession.

In the United States, the recessions following the oil shocks were the most severe since the Great Depression. The 1974-75 recession lasted 16 months, and led to a loss in GNP of more than 4 percent and a loss in industrial production of more than 15 percent.

The prolonged recessionary period 1980-82, which witnessed two separate downturns, involved a peak loss in GNP of 3 percent and a peak loss in industrial production of 13 percent. The impact of the first OPEC price increase on the Consumer Price Index in 1974 is estimated at roughly 4 percentage points of the total.

For a variety of reasons, oil prices collapsed in 1986, resulting in a collapse in domestic oil drilling. This increased the Nation's vulnerability to future energy embargoes as our imports from the Middle East have quadrupled. By October of 1988, 43

percent of U.S. demand for oil was fulfilled by imports. It is estimated that if the December 1988 production level is maintained throughout 1989, domestic oil production will be the lowest in a quarter of a century.

Crude oil from Alaska's North Slope's producing fields provides nearly 25 percent of total U.S. crude oil domestic production; however, many of these fields have already reached peak production and are now in a state of decline. Prudhoe Bay production, which in 1986 averaged 1.5 million bpd will fall to 280,000 bpd by the year 2000. As this decline from our largest source of domestic production continues, as in older fields in the lower-48 states, we have the risk of becoming significantly more dependent upon imports.

As Americans, we are concerned about these trends. We remember the long gasoline lines during past embargoes. We remember our factories forced to close or slow-down due to inadequate energy supplies. We remember our employees laid off--too many ultimately losing their jobs due to foreign competitors. This is not a history we want to repeat.

Given this history, NAM believes that the U.S. petroleum industry must have the ability to explore and produce new sources of oil in an environmentally sound manner. The Department of the Interior has described the Coastal Plain of ANWR as the nation's "best single opportunity to increase significantly domestic oil production."

HISTORY OF THE COASTAL PLAIN

The history of ANWR is inexorably tied to the complexities and histories of several federal statutes of the past three decades. Among these are the Alaska Statehood Act, the Alaska Native Claims Settlement Act, the National Wildlife Refuge System Administration

Act, and the National Wilderness Preservation System Act.

Within this legislative framework, ANWR was established in 1960 as the 8.9 million acre Arctic National Wildlife Range. With the adoption of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA), the original acreage was doubled and the area designated a Federal Wildlife Refuge. Eight million acres of the Refuge were set aside as Wilderness. Per a congressional ANILCA compromise, 1.5 million acres (100 miles long and 30 miles wide, or 8 percent of the 19 million acre Refuge) were set aside for further study of its resources and wildlife values. In April 1987, the Department of the Interior transmitted the report to Congress as required by Section 1002 of ANILCA, recommending that the entire 1.5 million acre Coastal Plain be opened for oil and gas leasing. The "1002 Report" estimated that there is a 95 percent chance that the Coastal Plain contains more than 4.8 billion barrels of oil and 11.5 trillion cubic feet of natural gas in place.

ENVIRONMENTAL IMPACT

The major environmental concern to development of ANWR is the welfare of the herd of the 180,000 caribou in the Porcupine caribou herd which use the Coastal Plain as a calving area in summer months. We are convinced that the wildlife habitat and the environment need not be "sacrificed" to explore for and develop oil. Careful planning and operating stipulations can accommodate both development and environmental concerns.

Numerous laws and regulations also assure that oil and gas activities be designed to protect the surrounding environment. Experience in Alaska and the lower 48 states shows that oil and gas activities are consistent with other goals such as wildlife protection.

Nearly 20 years of experience on the North Slope demonstrates this. Techniques employed to minimize disturbances include directional drilling, smaller and consolidated facilities, winter construction, use of temporary ice roads, special arctic equipment, and elevated pipelines and facilities.

ECONOMIC BENEFITS

It has been estimated that development of ANWR could yield a net national economic benefit of more than $300 billion. These benefits would be manifested in new jobs, lower balance of trade deficits and increased tax revenues to all government levels. These and other economic benefits would reach all 50 states. For example, since 1974, oil companies developing North Slope fields have pumped more than $36 billion into business in all 50 states. And this figure since 1980 alone is estimated to be over $10 billion. As a result, development of an Alaskan resource is not just an Alaskan benefit: the State and Federal governments benefit from increased royalty collections; the consumer benefits from more stable prices; our national security is enhanced by more dependable sources of supply; manufacturing in every state benefits by supplying equipment, rigs, pipe steel and instruments; and thousands of new jobs are created nationwide to service and supply the oil industries.

CONCLUSION

NAM member companies are concerned about the environment, but we are also concerned about our economic and national security. We do believe that oil and gas production on a

small portion of ANWR's Coastal Plain can be done in an environmentally safe manner. If approval is given now, the lead time before any production would begin would be well over 10 years. Imported oil is the largest component of our trade deficit. Our reliance on unsure sources of oil dictate foreign policy options, such as military presences, which this country may otherwise not choose to follow. We must approve S. 406 now.

NATIONAL OCEAN INDUSTRIES ASSOCIATION

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STATEMENT

OF THE

NATIONAL OCEAN INDUSTRIES ASSOCIATION

on

Legislation to Open the Coastal Plain of the Arctic National Wildlife Refuge to Oil and Gas Leasing

Before the
Senate Energy and Natural Resources Committee

March 6, 1989

Washington, D.C.

The National Ocean Industries Association is a national trade association based in Washington, D.C. with more than 325 member companies. Each of these companies is engaged in one aspect or another of discovering and developing our nation's offshore oil and gas resources. Our member companies are headquartered in 34 states and the District of Columbia and have plant locations or operations in all 50 states.

NOIA believes exploration and development operations on the coastal plain of the Arctic National Wildlife Refuge (ANWR) are vital to America's energy and economic future. There is a general concensus among knowledgeable people that one of the nation's best hopes for major new oil and gas discoveries is in the ANWR coastal plain. Industry activity to date indicates that significant petroleum reserves may be found there and extend out under the Beaufort Sea. The uncertainty of reliance on an oil supply emanating from the Middle East, and its destabilizing effect on the U.S. economy, are historically proven facts. If the United States is to free itself of a dangerous overdependence on oil imports from those sources, we must move ahead with the task of finding and developing the potentially vast oil and gas resources beneath the ANWR coastal plain.

Based on the more than 20 years of petroleum industry experience on Alaska's North Slope, we are confident that oil and gas operations can be conducted on the ANWR coastal plain without harm to caribou and other wildlife in the area. Such operations can and will be carried out in a manner totally compatible with the sensitive arctic environment. We are not talking theory or abstract concept in this regard. We can cite many examples of high standards and time-tested safeguards as well as a record of producing new technologies which enable industry to manage production competently in the arctic environment. We see no environmental justification for delaying or prohibiting oil and gas operations on the ANWR coastal plain.

This vitally needed oil and gas development can help meet America's energy needs in the 1990s and beyond. Development will also bring important economic benefits in terms of jobs and business for virtually every state in the union. The American Petroleum Institute has estimated that, based on ANWR coastal plain peak production between 350,000 and 2.7 million barrels of oil daily, projected employment gains would range between 138,000 to more than 1 million jobs, and the gross national product would increase from 0.14 percent to 1.01 percent above the levels that would otherwise be the case.

ANWR development will also mean increased funds from leasing bonuses, rents, and royalties for the federal government that can help reduce our serious budget deficit. These significant benefits are frequently overlooked in our discussion of the need for Alaska oil and gas development. The distribution of the potential revenues among the federal, state, and local governments depends on the details of how the area is leased. But the resulting revenues would be significant -- in 1984 alone, Alaska received some $1.4 billion in oil royalties, rents, and bonuses from leases on its own lands.

As an obvious example of these benefits to the private sector, oil companies operating on the North Slope between 1980 and 1986 spent more than $10.5 billion in the United States on the development of these oil fields. Every state in the union took part in supplying goods or services; the share of the business ranged from $3.4 billion spent in Texas, $1.8 billion in California, $1.3 billion in Alaska to $300,000 in New Hampshire, and $200,000 in West Virginia.

While discoveries in ANWR would add significantly to the U.S. petroleum reserve base, other economic benefits throughout the nation are undeniable. NOIA member companies greatly benefitted from previous Alaskan oil field activity. A new field of the size thought to lie beneath the ANWR coastal plain would very positively affect the oil and gas service industry in such a way as to help offset the recent downturn caused by depressed oil prices. The "multiplier" theory of economic effects aptly applies to oil and gas exploration and development of the ANWR coastal plain. The economic benefits to be reaped by the entire nation should be a significant factor in this discussion.

Crude oil from the North Slope's producing fields is already contributing about 20 percent of U.S. oil production. As production in the older fields of the lower 48 states continues to decline, America's dependence on foreign oil continues to increase. Alaska's undiscovered oil and gas is one of the key resources to which our nation must turn if our future energy security is to be assured.

In summary, NOIA believes the opening of the ANWR coastal plain to oil and gas leasing, exploration, and development is a positive step for many sectors of U.S. industry. The benefits of successful ANWR coastal plain development would be felt nationwide by increases in jobs in many diverse industries. This is a critically important step that must be taken if our nation is to have the more secure energy sources it needs for the decades to come - a source free from the threat of future supply disruptions. At a time of continuing -- and perhaps escalating -- political chaos and war in the Middle East, we have no choice but to find and develop the oil and gas resources within our own borders. The ANWR coastal plain is one place to start.

national grange

1616 H STREET N.W. WASHINGTON, D.C. 20006 (202) 628-3507

March 2, 1989

The Honorable J. Bennett Johnston, Chairman
The Honorable James A. McClure, Ranking Minority Member
Senate Committee on Energy and Natural Resources
364 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senators Johnston and McClure:

On March 6th, the Senate Energy and Natural Resources Committee will hold a hearing to consider S. 406, legislation that will allow the development of the oil and natural gas resources of the Coastal Plain region of the Arctic National Wildlife Refuge in Alaska. Last November, the delegates to the 122nd Annual Convention of the National Grange adopted the following policy resolution on the ANWR on behalf of the 335,000 Grange members across the nation:

> "The National Grange urges the United States Congress to adopt the recommendations of the United States Fish and Wildlife Service, the Secretary of Energy and the Secretary of the Interior to approve the exploration and production of oil reserves on the Coastal Plain of the Arctic National Wildlife Refuge in accordance with the terms of an environmentally sound development plan."

The United States' energy security and energy availability are of deep concern to U.S. agriculture and rural America. Petroleum products, both directly and indirectly, constitute one of the highest costs of production on modern farms. Petroleum product availability is crucial to hundreds of thousands of family farms that must rely upon the cycles of nature to dictate their planting and harvesting schedules. Overall, rural residents pay a higher percentage of their disposable income for petroleum energy products than urban residents due to higher transportation and heating/air conditioning costs.

In recent months, the United States has been importing over 50% of its crude oil. Over an extended period of time, this heavy reliance on foreign oil supplies threatens the United States' energy security. The exploration and development of the ANWR Coastal Plain would provide a potentially large supply of domestic petroleum and would keep jobs and trade dollars in the United States, thus strengthening our economy. Meanwhile, our nation could reduce our dependence on foreign oil suppliers from areas of the world that are threatened by political instability.

The success of the oil development program at nearby Prudhoe Bay shows that similar development in the ANWR can be accomplished with minimal

impact on the environment. The current drilling and construction techniques in the Arctic leave the surrounding tundra unspoiled. Wildlife species, such as caribou, are heavily shielded from contact with man and are thriving in the vicinity of the oil operations. The release of all materials into the environment from all aspects of oil production are extensively monitored and meet all of the federal, state and local governments' standards.

If environmental concerns are properly heeded, the Grange believes that ANWR development can be a part of a comprehensive national energy policy that includes increased conservation, more efficient use of traditional domestic energy resources, and increased use of alternative energy sources, such as alcohol fuels. Such a national energy policy would help to secure our nation's energy security. The National Grange believes that the Committee on Energy and Natural Resources should move without delay to report favorably on S. 406, or similar legislation, to allow the development of the petroleum resources of the Coastal Plain of the Arctic National Wildlife Refuge.

Thank you for the opportunity to inform you about Grange policy. I would appreciate this letter being made a part of the official hearing record. Additionally, I would be interested in receiving any comments that you, or any of the members of the Energy and Natural Resources Committee, might have on this issue.

Sincerely,

Leroy Watson

Leroy Watson
Legislative Representative

LAW/pkh

TESTIMONY OF MORRIS J. AMITAY
SUBMITTED TO THE
SENATE ENERGY & NATURAL RESOURCES COMMITTEE

March 6, 1989

Mr. Chairman:

My name is Morris J. Amitay. I am currently an attorney here in Washington, D.C., a Vice President of the Jewish Institute for National Security Affairs, and a former Executive Director of the American Israel Public Affairs Committee.

I am submitting this testimony on behalf of an ad hoc group of Jewish community leaders from around the country calling ourselves Americans for a Rational Energy Policy. We seek to educate the American public, the Jewish community and the Congress about the link between greater U.S. energy independence and freeing our foreign policies from oil blackmail. We have joined, with many other groups, the Coalition for American Energy Security, to urge the Congress to open the Coastal Plain of Alaska to exploration and development.

In the past we have taken stand/ in favor of the expeditious filling of our nation's Strategic Petroleum Reserve and the deregulation of natural gas. Today the major issue we are concerned about is the future development of the energy resources of the Arctic Coastal Plain. This concern has been heightened by the Nation's imports of oil overtaking domestic production.

The decisions that your Committee and Congress must take with regard to the future development of oil reserves in the Arctic National Wildlife Refuge will undoubtedly have important ramifications not only for U.S. foreign policy in the Middle East, but also our Nation's economic well-being. Americans who recognize the danger of growing U.S. dependence on foreign source oil, and particularly Middle East oil, should not hesitate in supporting legislation permitting orderly exploration and development in the relatively small Coastal Plain area with due regard for environmental safeguards.

We are faced with the undeniable fact that the current flow of 2 million barrels of oil per day from the adjacent Prudhoe Bay is now in decline. The Prudhoe Bay reservoir is more than half depleted already. It is due to run out by the end of this century. Potential production from new finds in the Coastal Plain of ANWR is virtually the only domestic substitute and will, after authorization, take ten years to bring on stream.

While we also support increased conservation measures and greater attention and resources devoted to the development of alternative energy sources, the most urgent energy issue to come before the 101st Congress will be whether development of the Coastal Plain of ANWR will be permitted.

The large flotilla of American and other Free World warships which was deployed in the Persian Gulf, was a telling sign of how energy dependence dictates foreign policies. And the gasoline lines of 1974 we had to endure demonstrated how the oil weapon could be used as an instrument of coercion and blackmail.

A recently released report by the Anti-Defamation League of B'nai B'rith entitled "The Challenge Ahead: American Growing Dependence on Imported Arab Oil" (attached as Appendix A) specifically cites the need to open ANWR for oil development. It states:

> "Another way to encourage production is to open the Arctic National Wildlife Refuge to oil exploration and production. The ANWR, close to the giant Prudhoe Bay oil field on Alaska's North Slope, is considered by both government and industry geologists to be the most promising untapped province in North America for the discovery of a supergiant oil field. The mean estimate is 3.2 billion barrels of oil, the maximum estimate 9.2 billion barrels."

The growing concern by the organized American Jewish community is underscored by the 1988-89 Joint Program Plan for Jewish community relations which is guidance to eleven national and 113 community Jewish agencies. This document states:

> "The ability of our government to formulate and conduct foreign policy undominated by energy considerations, and without fear of economic reprisals, must be a clear, conscious and fundamental objective."

What remains is the difficult task of getting the American people and its elected representatives to acknowledge the

inextricable link between our national security and greater energy independence -- and make the hard decisions necessary.

If your Committee and the Congress acts responsibly on ANWR, in years to come we will be in a much better position to face up to attempts by foreign nations to play petro-politics with our oil needs.

ADL
INTERNATIONAL
REPORT

MIDDLE EAST

The Challenge Ahead: America's Growing Dependence on Imported Arab Oil

January, 1989
ANTI-DEFAMATION LEAGUE OF B'NAI B'RITH/823 UNITED NATIONS PLAZA/NEW YORK, NY 10017

ADL INTERNATIONAL REPORT

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I. The Present U.S. Oil Picture

American dependence on imported oil in general and on Arab oil in particular has increased substantially since world oil prices collapsed early in 1986 after Saudi Arabia doubled its production and flooded an already glutted market with additional supply.

There is growing evidence that the United States is getting "hooked" on cheap oil and that it is becoming increasingly vulnerable to future economic manipulation and political pressure by the dominant Arab members of OPEC. Friends of Israel and Americans concerned about the future independence of U.S. Middle Eastern policy — not to mention U.S. support for Israel in the years ahead — have begun to fear that, in the early 1990s, growing American reliance on Arab oil could undermine U.S. support for the Jewish State. They fear that, as in the late 1970s, U.S. Middle East policy could once again be the target of diplomatic and political blackmail by the dominant Arab members of OPEC and Iran, now no longer preoccupied by its war with Iraq.

Iraq itself is reemerging as a major oil power with tremendous oil reserves that some observers say make it a potential rival of Saudi Arabia. Western oil companies have already been reported beating a path to Baghdad to make deals.

The Effects of Cheap Oil

Lower oil prices in recent years have brought benefits to the American economy, to U.S. industry and to U.S. consumers. Lower oil prices have kept producer costs down and have helped to keep the lid on inflation. But many observers say that these are essentially short-run gains that have been purchased at long-run costs to the American economy and to U.S. national security interests, and that the country will pay dearly for them later.

Some of the costs of cheap oil have already been felt. The 1986 price collapse has had a devastating effect on the high-cost U.S. oil industry, which needs assured prices in the mid-$20 level per barrel for economic viability. With prices hovering between $10 and $17 in 1986, 1987, and 1988, U.S. oil industry budgets for exploration, drilling and production have been slashed — from a peak of $26.3 billion in 1981 to $19.8 billion in 1985, and to $9.6 billion in 1987.

The number of active drilling rigs in the U.S., which averaged a record high of 3,970 in 1981, declined to an average of 1,969 in 1985 and to less than 1,000 in 1986. In mid-1988, only 921 rigs were in operation.

The total number of oil and gas wells drilled, including both exploratory drilling and development drilling in and around existing fields, declined from a record high of more than 89,000 in 1981 to an average of more than 80,000 between 1981 and 1985, and then fell below 39,000 in 1986 and

below 35,000 in 1987.

The other major effect of cheap oil on America has been to stimulate oil consumption and to erode the American "conservation ethic" that helped break OPEC's power in the early 1980s. Americans are driving more, buying bigger cars, driving faster, as if oil supplies were limitless and there were no tomorrow. U.S. oil demand since 1985 has skyrocketed at the very time that U.S. oil production has been hit by the very same lower prices.

In short, American consumption of petroleum is up, American production is down, and U.S. imports of foreign oil generally and Arab oil in particular have increased dramatically.

Vital Oil Statistics

1. U.S. Oil Consumption: Since 1985, U.S. oil demand has increased 1.3 million barrels a day, or 8.2%. In 1985, the U.S. consumed an average of 15.726 million barrels a day. In the first 10 months of 1988, the U.S. consumed an average of 17.015 million barrels a day.

2. U.S. Oil Production: U.S. crude oil production has decreased 801 thousand barrels a day since 1985, a decline of 8.93%. In 1985, U.S. output averaged 8.971 million barrels a day. During the first 10 months of 1988, U.S. crude production averaged 8.170 million barrels a day.

3. U.S. Oil Imports: Since 1985, U.S. imports of foreign oil have increased 1.951 million barrels a day — an increase of 38.7%. In 1985, U.S. imports averaged 5.067 million a day. In the first nine months of 1988, U.S. oil imports averaged 7.018 million barrels a day. These imports amounted to 41.3% of U.S. oil consumption.

4. U.S. Imports from OPEC: U.S. imports from OPEC since 1985 have increased 1.528 million barrels a day, or 83.5%. In 1985, U.S. imports from OPEC averaged 1.83 million barrels a day. In the first nine months of 1988, U.S. imports from OPEC countries averaged 3.358 million barrels a day. These imports from OPEC constituted 19.7% of U.S. oil consumption in 1988.

5. U.S. Oil Imports from Arab OPEC Countries: Since 1985, U.S. oil imports from the Arab members of OPEC have increased 1.291 million barrels a day, or 274%. During 1985, U.S. imports from Arab OPEC countries averaged 472 thousand barrels a day. During the first nine months of 1988, imports from Arab OPEC countries rose to an average of 1.763 million barrels a day. Arab oil supplied 10.36% of U.S. oil consumption during 1988.

6. U.S. Oil Imports from Saudi Arabia: Since 1985, U.S. oil imports from Saudi Arabia have increased 855 thousand barrels a day, or 509%. In 1985, U.S. imports from Saudi Arabia averaged 168 thousand barrels a day. During the first nine months of 1988, U.S. oil imports from Saudi Arabia averaged 1.023 million barrels a day. In 1988, Saudi Arabia supplied 6.01% of U.S. daily oil consumption.

The Bottom Line

U.S. oil production has declined almost a million barrels a day since 1985, while in the same period, U.S. oil consumption has increased by more than a million barrels a day. The net loss for the U.S. since the end of 1985 amounts to about two million barrels a day in decreased production and increased consumption.

The two-million barrel a day "deficit" has been made up by oil imports from abroad. More than three-fourths of the increased imports — almost four-fifths — have come from OPEC and two-thirds of America's increased imports have come from the Arab members of OPEC. Saudi Arabia has supplied 44% of America's daily oil imports increase, 66% of the increase from Arab OPEC.

U.S. oil imports from Arab OPEC countries constituted 3% of U.S. oil consumption in 1985, 7.14% in 1986, 7.64% in 1987, and 10.36% during the first nine months of 1988. U.S. dependence on oil from Saudi Arabia was 1% of U.S. consumption in 1985. By 1988 it had risen to 6%.

U.S. dependence on imported oil was 32.2% in 1985, 38.2% in 1986, 40% in 1987 and 41.3% during the first nine months of 1988.

In 1987, the cost of imported oil to the United States amounted to an estimated $42 billion -- which was 25% of the country's trade deficit -- and the prospects for a decline in American outlays for oil imports, in the short run or the long run, were slim.

II: OPEC's Problems

Despite growing U.S. dependence on imported oil generally and Arab OPEC oil in particular, it does not seem likely, in the short run, that the Arab oil states will be able to use oil blackmail against the United States for their own economic and political purposes as they did in the 1970s. OPEC itself, including its Arab members, has faced serious problems in recent years, not the least of which is that, for the time being at least, it has not been able to control the supply of oil on the world market or the price it commands.

OPEC members have needed oil revenues to meet their domestic needs and have been overproducing relative to world demand for oil. The world has been awash with oil and prices have tumbled, leading OPEC members to produce even more oil to shore up their revenues. This cycle of glut has continued for some years now.

For most of the last seven years, in fact, OPEC has met repeatedly to try to forge production and pricing agreements among its members that would stabilize the market by assigning output quotas to OPEC members. But either the cartel could not agree on production quotas or target prices, or agreements that were reached broke down because of member cheating on prices or by exceeding output quotas.

Early in 1986, oil prices collapsed. From a $25-a-barrel level at the start of 1986, prices tumbled to the $10 level in July of that year. Confronted with this squeeze, OPEC reached an agreement in the fall of 1986 setting production ceilings of 15.5 million barrels a day for the first half of 1987, 16.6 million barrels a day for the third quarter, and 18.3 million barrels for the fourth quarter of 1987. OPEC also fixed a target price of $18 a barrel. During 1987, prices recovered to the $18-$19 level. But the OPEC agreement did not hold.

OPEC's Persistent Problem: Overproduction

OPEC has been facing a persistent crisis of overproduction. During 1988, world demand for oil averaged between 17 and 18 million barrels a day.

But with widespread cheating on quotas, OPEC was seriously overproducing, pumping out an average of 22 to 23 million barrels a day and thus adding some 4 or 5 million barrels a day to the already existing world petroleum glut.

The end of the eight-year Iran-Iraq war confronted OPEC with yet another problem: the need of both Iran and Iraq for oil revenues to rebuild their damaged countries and their economies.

Widespread Cheating on OPEC Output Quotas

As OPEC prepared to meet in Vienna late in November 1988 to try to reach a new agreement, the price of oil was hovering at $11-$12 a barrel and almost all the members were exceeding their production quotas -- not only poorer members like Nigeria and Algeria, which always need as much oil income as they can get, but also wealthier Arab OPEC members like the United Arab Emirates (U.A.E.), Kuwait, Saudi Arabia and Qatar.

The U.A.E. has defied OPEC production discipline for some time. In June 1988, the U.A.E. announced that its assigned quota of 948 thousand barrels a day would no longer be honored. The Emirates claimed a quota of 1.5 million barrels a day and as OPEC prepared to gather in Vienna had been producing almost 2 million barrels a day for several months.

There were also differences among OPEC members, especially the Arab members, over long-term strategy. They all wanted to maximize their oil incomes, but disagreed on how best to achieve that goal.

As OPEC gathered in Vienna, the Saudis were seeking an agreement among all 13 OPEC members to reduce overall production by about 3.5 million barrels a day -- to about 18.5 million barrels daily instead of the 22-23 million barrels the cartel was pumping.

Kuwait was reported to be hoping for still lower prices, closer to about $10 a barrel. The Kuwaitis were said to believe that with prices at that level, OPEC could capture market share from non-OPEC oil producing nations, such as the U.S., Great Britain and Norway, whose production costs are much higher. Kuwait, with an assigned quota of 996 thousand barrels a day, was reportedly pumping 1.4 million barrels a day during August 1988.

Iraq's assigned quota was 1.6 million barrels a day but the need for money to repair war devastation led the Iraqis to pump more than 2.7 million barrels a day during the summer of 1988. Iraq was also demanding parity with Iran, which had a quota of 2.4 million barrels a day.

The Iranians have always been price "hawks" in OPEC deliberations and low prices of the kind the Kuwaitis were pushing for would hurt Iran, which needed oil revenue desperately to repair war damage after the eight years of conflict with Iraq.

Saudi Arabia's Role

Like other members of OPEC, the Saudi Arabians have also needed oil revenue. The Saudis used to show budget surpluses of $20 billion to $30 billion from their oil revenues. But in 1988, they were projected to show a deficit of $17 billion, their fourth deficit in a row. Since 1983, Saudi Arabia has been running the largest annual current-account deficits within OPEC.

Saudi Arabia has the largest oil reserves in the world but the oil price

decline of recent years -- in part created by the Saudis themselves -- has hurt its revenues and deficits have sharply cut into its currency reserves, once valued at nearly $200 billion.

For many years, the Saudis acted as OPEC's "swing producer," cutting their own production when necessary to keep total OPEC output within the cartel's limits. As a result, in a period of seven years, the Saudis saw their own production drop from almost 10 million barrels a day to less than 3 million. Late in 1985, the Saudis decided to raise their production sharply and drive oil prices down. They had three ostensible purposes: to force some production discipline on their OPEC partners, to regain market share, and to undercut non-OPEC oil producers, including the U.S., whose production had surged because of steep OPEC prices of the late 1970s which also discouraged consumption around the world.

The boost in Saudi production during late 1985 and early 1986 succeeded in driving prices down and in harming non-OPEC production, especially in the U.S. But the price plunge from $25 to almost $10 cost the Saudis revenue. They doubled their production but their oil income went down.

Prices later recovered, but as OPEC prepared to meet in November 1988, the Saudis were still seeking to force production restraint on the cartel and to push prices up to the $16 to $20-a-barrel level from around $12 a barrel.

The Saudis have been far shrewder in the middle and late 1980s than they were in the 1970s, when they drove prices too high and set in motion an energy revolution around the world. Then, nation after nation cut oil consumption and non-OPEC oil exploration and production surged. Industrialized nations switched to alternate fuels, primarily coal and nuclear power. The world market for OPEC oil was seriously damaged.

Now the Saudis seem to have gauged the new realities of the world oil market, especially the U.S. market, far more carefully and seek to set prices more precisely -- to retain a market for their own oil and OPEC oil generally and to maximize their revenues, while keeping oil prices low enough to stimulate U.S. and Western consumption and discourage higher-cost U.S. and Western oil production.

The Saudis are eyeing long-run economic and political goals that will enable them to remain the dominant OPEC producer. And, as U.S. oil demand -- and U.S. dependence on imported oil -- grows, the Saudis hope to regain political influence over U.S. Middle East policy with respect to Israel.

Already, many observers say they are well on their way to recovering their influential role, probably some time during the 1990s.

Saudi Arabia and Texaco

During 1988, Saudi Arabia moved toward a position as one of the biggest retail marketers of gasoline in the eastern United States. An affiliate of Aramco, Saudi Arabia's national oil company, bought 50% of Texaco's

distribution and marketing system in the East and Gulf Coast area. The system includes three refineries, 49 terminals, 1,450 service stations owned or leased by the oil company, and a distribution network covering 10,000 more stations bearing the Texaco name. The investment amounted to more than $1 billion.

The move represented a sharp departure from the previous logic that had controlled OPEC and its members in the 1970s, that the important end of the oil business was "upstream" -- the process of taking crude oil out of the ground -- and that was where the most profit lay.

Some analysts suggested that Saudi Arabia's willingness to invest "downstream" -- in the marketing of oil -- reflected the fact that Saudi Arabia's revenues from digging oil had fallen from $101.8 billion in 1981 to $17.5 billion in 1986. These analysts suggested that the Saudis felt they could make good profits by refining crude and selling oil products, such as gasoline, at the retail level, and that they could thus even out their sagging revenues from the production of crude oil alone. These analysts felt that the Saudis were seeking greater influence over the oil market by controlling the production and marketing process from the wellhead to the filling station pump.

OPEC's November 1988 Meeting in Vienna

At Vienna late in November 1988, OPEC reached a new production and pricing agreement after days of acrimonious negotiations.

The pact, for the first half of 1989, set a production limit of 18.5 million barrels a day, 3.5 to 4.5 million barrels a day lower than the 22-23 million barrels that OPEC had been producing during late 1988. The agreement aimed at a price of $18 a barrel. It formally included Iraq in the quota system with parity between Iran and Iraq at 2.6 million barrels each.

Early in 1989, there was widespread speculation about whether OPEC's Vienna agreement would hold or whether it would once again break down because of widespread cheating on output by OPEC members.

First reports, tenuous at best because based on too small a time frame to be conclusive, indicated that in the first days of 1989, OPEC had managed to cut production by some 4 million barrels a day to about 18.4 million barrels.

Most oil analysts indicated that OPEC would probably be able to maintain an average output of about 19 million barrels a day in the first few months of 1989 because world oil consumption remained surprisingly high, exceeding most previous estimates. These analysts indicated that first-quarter demand for OPEC oil would probably average about 19 million barrels a day and that the combined "call" on oil from OPEC and from inventory withdrawals would average 21-22 million barrels a day.

III. The Outlook, Short Run and Long Run

In the short run -- the next year or two -- it appears that OPEC will be preoccupied with trying to maintain discipline among its members and attempting to keep a lid on its overall production.

Before the early 1990s, the U.S. is not likely to be a target for Arab oil blackmail.

In the longer run, from the early 1990s and beyond, OPEC, led by its dominant Arab faction, stands a good chance of regaining a whip hand over the international oil market in general and over the U.S. in particular.

Despite their own problems, a number of factors on the world oil scene seem to be favoring the Arabs and their OPEC partners:

* Escalating U.S. oil imports, which have recently been higher than American domestic production in the Lower 48 States.

* U.S. production in the Lower 48 States has been steadily declining for a number of years -- since the early 1970s -- and will continue to do so.

* American production from Alaska's Prudhoe Bay Field, on line since it opened a decade ago in 1978, has been pumping out roughly 2 million barrels a day, but is now peaking and experts say it will start declining soon. They say that when the decline begins, it will be steep.

* U.S. demand for oil has been steadily rising after declining in the early 1980s. In the years 1981 to 1985 inclusive, U.S. demand averaged 15.5 million barrels a day, 3 million barrels less than the peak demand years of 1977-1979 inclusive. In 1986, 1987 and the first 10 months of 1988, U.S. demand averaged 16.65 million barrels a day. The U.S. has already surrendered one-third of the gains it made in saving oil during the early 1980s.

* Knowledgeable observers, including the American Petroleum Institute (API) and former Secretary of Defense and of Energy, James Schlesinger, recently warned that with falling production and rising demand, U.S. oil imports should probably rise to new highs by 1991, surpassing their previous peak in the late 1970s. Schlesinger said the U.S. would probably be importing 9 million barrels a day and that by the middle 1990s imports could reach 12 or 13 million barrels a day -- if that oil should be available.

* The API said that by the year 2000 -- just 11 years from now -- America's oil import bill might be running at $150 billion to $200 billion a year.

* Officials of the API estimated that OPEC has the capacity to produce 27-28 million barrels of oil and that OPEC would regain control of supply and

prices when world demand for OPEC oil exceeded 80% of OPEC's capacity -- approximately 21.6 to 22.4 million barrels a day. World demand for OPEC oil during 1988 was about 18 million barrels a day.

* As U.S. oil imports rise, the value of the Strategic Petroleum Reserve (SPR) is eroded. In 1985, the SPR contained 490 million barrels of oil which amounted to about 100 days' supply because in 1985 U.S. oil imports averaged 5 million barrels a day. Late in 1988, the SPR stood at 554 million barrels, but this larger amount amounted to less than 80 days' supply because since 1985 U.S. imports had gone up by about 2 million barrels a day -- to 7 million. Obviously, the more U.S. imports continue to escalate, the more the value of the SPR, in terms of the number of days it will last, will continue to erode.

IV. U.S. Options for the Years Ahead

The United States needs to buy time until new technological breakthroughs appear. It has to push as far into the future as possible the date when oil supplies tighten and the Arabs and OPEC regain the ability to call the shots in the world oil market.

The Strategic Petroleum Reserve (SPR) -- The SPR is the nation's first line of defense against sudden oil cutoffs or cutbacks. One obvious option for the U.S. would be to fill the SPR at an accelerated rate. Bringing the SPR rate up to 630 million barrels from the present 550 million would give the country a 90-day supply at current import levels. As U.S. imports rise, a higher SPR level would be required for a 90-day supply -- for instance, 720 million barrels if U.S. imports rise from 7 million to 8 million barrels a day, and 810 million barrels if U.S. imports rise to 9 million barrels a day. The nation's target goal is 750 million barrels by 1990, reduced from the original target of 1 billion barrels. To meet the 750 million barrel target by the end of 1990 would require a fill rate of about 275 thousand barrels a day during 1989 and 1990 -- four-and-a-half times the fill rate the country accomplished between 1985 and 1988. But with oil prices cheaper than in the past, filling the SPR at an accelerated rate appears to be a bargain worth seizing.

Discourage Oil Demand -- The American public uses less oil when the price goes up. A tax on oil or on gasoline, vigorously opposed by the oil industry, would nevertheless tend to discourage consumption. A 25 cents a gallon tax would, incidentally, cut the Federal deficit in half and still leave prices below the 1986 level.

Encourage Oil Production -- Easing restrictions on oil leasing on the Outer Continental Shelf off California, New England and Florida's West Coast is advocated by the oil industry. These are under leasing moratoriums imposed by Congress. The U.S. has leased only 3.5% of its total federal offshore acreage in contrast to Great Britain which has offered for leasing all of the North Sea acreage that appeared to have oil and gas potential, amounting to 47% of all its offshore acreage. Most oil spills in the U.S. have come from tanker accidents, not offshore drilling. It has been 19 years since a major oil spill from offshore development reached U.S. shores.

Another way to encourage production is to open the Artic National Wildlife Refuge to oil exploration and production. The ANWR, close to the giant Prudhoe Bay oil field on Alaska's North Slope, is considered by both government and industry geologists to be the most promising untapped province in North America for the discovery of a supergiant oil field. The mean estimate is 3.2 billion barrels of oil, the maximum estimate 9.2 billion barrels.

In two editorials during 1988, The New York Times supported opening the ANWR and said the nation's energy needs should take precedence over possible

damage to the Alaskan environment. The Times said in an editorial on November 30, 1988 that "careful development of oil reserves in the Alaskan wilderness might add as much as 10 per cent to domestic production in the late 1990s, just when it will be needed most."

Natural Gas — Government price controls on natural gas have long been controversial, but the potential for future natural gas discovery and development is large. The industry argues that removal of remaining price controls on natural gas at the wellhead would be the most positive step that the government could take to achieve the potential offered by natural gas to the nation's improved energy resources. Natural gas is a clean and useful fuel.

Coal — The United States is the Saudi Arabia of coal, with more than 60% of the free world's coal reserves, and recoverable reserves that are the energy equivalent of 911 billion barrels of oil — 31 times America's proved crude oil reserves and equal to about 300 years of domestic oil production at current rates. Today, coal supplies a little more than half of the electrical generating capacity of the U.S. and is surrounded by environmental problems and controversy centering around acid rain and the "greenhouse effect" of atmospheric warming. Nevertheless, given time and eventual higher prices for crude oil, the clean mining and burning of coal offers great hope for the future. Some advances in clean coal technology are already on line and others hold promise in the years ahead. Clean coal burning and the conversion of coal to synthetic gas and oil, both expensive, await improved technology and higher crude oil prices to make them economically viable.

Nuclear Power — In much of the industrialized world, the march toward greater use of nuclear energy has gone forward despite concern caused by the Chernobyl accident. France generates 70% of its electricity from nuclear power after only 15 years — without damaging accidents. Other industrialized nations from South Korea to Japan to West Germany are going forward with nuclear power development. So is the U.S.S.R., despite Chernobyl. Only in Sweden and the U.S. has fear hampered nuclear development. In the U.S. not a single nuclear plant has been put on the drawing board for 10 years. Nuclear power now produces 18% of U.S. electricity, the equivalent of about 2 million barrels of oil a day. This is far below earlier predictions, in 1980, that atomic energy would supply as much as 7 million barrels per day equivalent by now. The U.S. Energy Information Administration projects that additions to U.S. nuclear generating capacity will fall sharply after 1990, just about the time such capacity is likely to be needed most as oil production declines and consumption, with accompanying increases in oil imports, rises. Growing concern about the "greenhouse effect" and the burning of fossil fuels may eventually boost support for nuclear power, which does not contribute to global warming.

Solar and Other Renewable Energy Sources — Renewable energy, mainly from hydropower and the burning of biomass fuels, currently supplies 4 or 5% of all energy consumed in the U.S. Hydropower cannot appreciably increase its share of power generation. The Department of Energy has estimated that various renewable forms of energy will provide 13% of American energy consumption by the year 2000 and 15% by the year 2015. Today, solar energy

contributes less than 1% of U.S. needs but joint government-industry research has produced a number of technological breakthroughs that, eventually, could bring solar power costs closer to those for conventional power generation. Wind and geothermal energy have had limited uses on the American scene so far. Until now, they are too costly or limited by geographical location.

Shale Oil and Tar Sands — Shale oil has an eventual potential of up to 600 billion barrels of oil equivalent and tar sands some 2 billion barrels, but at present the costs of producing such oils make them uneconomic. Some estimates place the cost of large-scale shale oil production as high as $60 a barrel.

Anti-Defamation League of B'nai B'rith

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STATEMENT FOR THE RECORD BY

DR. PAUL FREEDENBERG

UNDER SECRETARY OF COMMERCE
FOR
EXPORT ADMINISTRATION

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES

U.S. SENATE

MARCH 6, 1989

MR. CHAIRMAN, AS YOU REQUESTED, I AM PLEASED TO PROVIDE THE DEPARTMENT OF COMMERCE VIEWS ON THE THREAT TO THE NATIONAL SECURITY POSED BY RISING LEVELS OF OIL IMPORTS AND HOW OIL AND NATURAL GAS PRODUCTION FROM THE COASTAL PLAIN OF THE ARCTIC NATIONAL WILDLIFE REFUGE (ANWR) COULD HELP ALLEVIATE THIS THREAT. IN ADDITION TO THIS STATEMENT, THE DEPARTMENT WILL ALSO PROVIDE TO THE COMMITTEE IN THE NEAR FUTURE A LETTER WHICH DISCUSSES OTHER ASPECTS OF S. 406.

THE DEPARTMENT OF COMMERCE'S RECENT INVESTIGATION ON IMPORTS OF PETROLEUM, CONDUCTED PURSUANT TO SECTION 232 OF THE TRADE EXPANSION ACT, FOUND THAT THE MAINTENANCE OF U.S. ACCESS TO SUFFICIENT SUPPLIES OF PETROLEUM IS ESSENTIAL TO OUR ECONOMIC SECURITY, FOREIGN POLICY FLEXIBILITY, AND DEFENSE PREPAREDNESS. GIVEN THESE FACTORS, THE SECRETARY OF COMMERCE FOUND THAT PETROLEUM IMPORTS THREATEN TO IMPAIR THE NATIONAL SECURITY.

SECRETARY C. WILLIAM VERITY, THEN SECRETARY OF COMMERCE, MADE A NUMBER OF RECOMMENDATIONS ON HOW TO ENHANCE U.S. ENERGY SECURITY, WHICH INCLUDED URGING THE CONGRESS TO PERMIT ENVIRONMENTALLY SOUND OIL EXPLORATION AND DEVELOPMENT OF THE ANWR IN ALASKA. ON JANUARY 3, 1989, THEN PRESIDENT REAGAN APPROVED THE COMMERCE FINDING AND THE RECOMMENDATIONS.

THE LEASING AND DEVELOPMENT OF THE OIL AND NATURAL GAS RESOURCES OF THE COASTAL PLAIN OF THE ANWR WOULD REPRESENT AN IMPORTANT STEP IN ENHANCING U.S. ENERGY SECURITY IF IT CAN BE DONE IN AN

ENVIRONMENTALLY SOUND MANNER. EXPLORATION OF AND PRODUCTION FROM THE ANWR WOULD SERVE TO LIMIT OUR GROWING DEPENDENCE ON OIL IMPORTS.

THE DEPARTMENT OF COMMERCE'S REPORT ON ITS SECTION 232 INVESTIGATION ON THE EFFECTS OF OIL IMPORTS ON THE NATIONAL SECURITY REACHED A NUMBER OF CONCLUSIONS ON THE IMPACT OF GROWING U.S. OIL IMPORTS.

- IT CONCLUDED THAT BY THE MID-1990'S AND BEYOND THE UNITED STATES MAY BE IMPORTING ABOUT HALF OR MORE OF ITS OIL CONSUMPTION.
- TO THE DEGREE THAT THE UNITED STATES AND OTHER CONSUMING NATIONS IMPORT MORE OIL IN THE FUTURE, IT IS PROJECTED THEY WILL TURN INCREASINGLY TO THE OPEC COUNTRIES.
- THE UNITES STATES' GROWING DEPENDENCE ON OPEC OIL WILL RESULT IN INCREASED IMPORTS FROM THE OIL PRODUCING COUNTRIES IN THE PERSIAN GULF. THESE PRODUCING COUNTRIES HAVE THE LARGEST AMOUNT OF SURPLUS OIL PRODUCTION CAPACITY AND RESERVES.
- FINALLY, DEPENDENCY ON A SMALL NUMBER OF SUPPLIERS LOCATED IN THIS VOLATILE REGION COULD MAKE THE UNITED STATES VULNERABLE TO OIL SUPPLY DISRUPTIONS OR CARTEL MANIPULATION OF PRODUCTION AND PRICE.

THE REPORT ALSO POINTED OUT THE IMPORTANT TRADE CONSIDERATIONS ASSOCIATED WITH THE EXPLORATION AND DEVELOPMENT OF THE COASTAL

PLAIN OF ANWR. THE REPORT STATED THAT "[I]F CONGRESS DECIDED TODAY TO ALLOW EXPLORATION AND DEVELOPMENT, THE ANTICIPATED OUTPUT AFTER THE YEAR 2000 COULD POTENTIALLY BE AS MUCH AS 1 TO 1.5 MILLION BARRELS PER DAY." IF OIL PRICES RISE TO $30 PER BARREL EARLY IN THE NEXT CENTURY, THE TRADE DEFICIT COULD BE REDUCED BY $11 TO $16 BILLION PER YEAR.

U.S. OIL PRODUCTION HAS BEEN DECLINING SINCE 1986. AT THE SAME TIME, PETROLEUM IMPORTS HAVE BEEN INCREASING FOR THE PAST THREE YEARS. IN 1988, NET IMPORTS REACHED 6.4 MILLION BARRELS PER DAY. MOREOVER, U.S. OIL IMPORTS ARE LIKELY TO INCREASE IN THE YEARS AHEAD BECAUSE DOMESTIC RESERVES OF ECONOMICALLY RECOVERABLE OIL ARE DECLINING.

THE MOST PROMISING CURRENTLY KNOWN ONSHORE PROSPECT FOR MAJOR NEW OIL FIELDS IN THE UNITED STATES IS THE COASTAL PLAIN OF THE ANWR. THE 1.5 MILLION ACRE COASTAL PLAIN HAS THE POTENTIAL OF UP TO 9 BILLION BARRELS OR MORE OF RECOVERABLE OIL ACCORDING TO ESTIMATES MADE BY THE DEPARTMENT OF THE INTERIOR. THE COASTAL PLAIN IS 65 MILES EAST OF PRUDHOE BAY -- THE LARGEST OIL PRODUCING FIELD IN THE UNITED STATES. CONSEQUENTLY, IT CAN BE EASILY INTEGRATED INTO THE TRANS-ALASKA PIPELINE DELIVERY INFRASTRUCTURE.

EARLY CONGRESSIONAL PASSAGE OF LEGISLATION WHICH WOULD ALLOW THE EXPLORATION AND DEVELOPMENT OF THE COASTAL PLAIN IS IMPORTANT FOR A NUMBER OF REASONS.

- THERE IS A LONG LEAD TIME IN ALASKA BETWEEN EXPLORATION AND COMMERCIAL PRODUCTION.
- IF CONGRESS DECIDED IN 1989 TO ALLOW EXPLORATION AND DEVELOPMENT OF THE COASTAL PLAIN, LARGE-SCALE OIL PRODUCTION WOULD NOT OCCUR UNTIL THE YEAR 2000.
- ALASKAN OIL PRODUCTION FROM PRUDHOE BAY IS EXPECTED TO PEAK IN THE NEAR FUTURE AND A DECLINE IS EXPECTED NOT LATER THAN THE EARLY 1990'S.
- FINALLY, OIL FROM THE COASTAL PLAIN AREA COULD HELP TO LIMIT FUTURE DECLINES IN ALASKAN PRODUCTION AND REDUCE THE NEED FOR INCREASED IMPORTS DURING THE 1990'S.

THERE HAS BEEN NO CHANGE IN THE U.S. ENERGY SITUATION SINCE THE ISSUANCE OF OUR SECTION 232 REPORT. DOMESTIC PRODUCTION CONTINUES TO DECLINE AND OIL IMPORTS KEEP RISING. IN VIEW OF THESE FACTS, THE DEPARTMENT WOULD SUPPORT LEGISLATION WHICH WOULD AUTHORIZE COMPETITIVE OIL AND NATURAL GAS LEASING AND DEVELOPMENT OF THE COASTAL PLAIN OF THE ANWR IN A MANNER CONSISTENT WITH THE PROTECTION OF THE ENVIRONMENT.

International Association of Fish and Wildlife Agencies
(Organized July 29, 1902)
Hall of the States
444 North Capitol St. NW, Suite 534, Washington, DC 20001 (202) 624-7890
R. Max Peterson, Executive Vice President

27 March, 1989

Honorable J. Bennett Johnston, Chairman
Senate Committee on Energy and Natural Resources
SD-364 Dirksen Senate Office Building
Washington, DC 20510

Dear Senator Johnston:

I am writing to comment on S 406, the Arctic Coastal Plain Competitive Oil and Gas Leasing Act, for the International Association of Fish and Wildlife Agencies. The International Association of Fish and Wildlife Agencies is a quasi-governmental organization of public agencies charged with the protection and management of North America's fish and wildlife resources with all 50 states as members. The Association has been a key organization in the promotion of the principles of sound resource management and the strengthening of federal, state, and private cooperation in protecting and managing fish and wildlife and their habitats in the public interest.

The Association's position on energy development in the Arctic National Wildlife Refuge (ANWR) is outlined in the enclosed statement. Should development occur, the Association supports strict controls and specific provisions for funding adequate monitoring, inspection, on site rehabilitation and mitigation of unavoidable environmental conflicts. I would also like to specifically address the revenue sharing provisions of S 406. If oil and gas resources under the refuge are developed, a major share of the revenue should further the purpose for which the National Wildlife Refuge System was established. These activities include, but are not limited to: funding the North American Waterfowl Management Plan, expansion of the National Wildlife Refuge System, enhancement of Refuge fishery programs, and funding for the Fish and Wildlife Conservation Act of 1980.

If revenues are placed in the Land and Water Conservation Fund, as proposed by S 406, past experience indicates that only a small portion would be used for fish and wildlife purposes.

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Executive Secretary
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LARRY J. WILSON, Des Moines, IA

The Association appreciates the opportunity to comment on S 406. I would be pleased to discuss this further with you to ensure that the natural resources of the ANWR are protected if energy development occurs on the Coastal Plain.

Sincerely,

George D. Lapointe
Legislative Counsel

Enclosure

International Association of Fish and Wildlife Agencies
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444 North Capitol St., NW, Suite 534, Washington, DC 20001 (202) 624-7890
Jack H. Berryman, Executive Vice President

Recommendations of the Land Resources Committee
for the 1002 Area of the Arctic National Wildlife Refuge, Alaska

Adopted During the Association's 77th Annual Meeting
September 17, 1987, Winston-Salem, North Carolina

With respect to the Department of the Interior's proposal to open the Coastal Plain, or 1002 area, of the Arctic National Wildlife Refuge in Alaska to oil exploration and extraction, the Land Resources Committee recommends that the Association's position include the following tenets:

--The Association recognizes the significant and unique fish and wildlife resources of the Refuge, and unless determined to be necessary, these resources should remain undisturbed.

--That the Association does not have the expertise to judge the extent of recoverable oil reserves on the Refuge and how the national interest may be served by developing potential energy reserves there.

--Any congressional decision to explore and extract oil and gas from the Refuge must be done in such a manner so as to have minimum impact on the Refuge wildlife and make provision for the enhancement of the Nation's fish and wildlife resources.

--When appropriate, the Association should be prepared to recommend criteria and mechanisms to minimize impacts on fish and wildlife, including areas to be excluded from development.

--Unavoidable losses, especially to important wildlife habitat areas, must be offset on site to the extent possible, as a cost of exploration and extraction.

--If Congress allows energy development on ANWR, a substantial portion of all revenues generated from exploration must be used for the purposes to which the National Wildlife Refuge System was established. Activities that support that purpose include, but are not limited to:

a) Funding the North American Waterfowl Management Plan.

b) Expansion of the National Refuge System.

c) Enhancement of the Refuge Fishery Program.

d) Funding of the Fish and Wildlife Conservation Act of 1980.

--The Association will seek assurances that oil and gas development on ANWR will minimize long-range adverse impacts on the Nation's fish and wildlife resources.

J. Dennis Stacey
P.O. Box 9 - 1219 / Anchorage, Alaska 99509-1219
Phone (907) 277-4423 Fax (907) 279-6084

March 7, 1989

To: All Members
Senate Committee on Energy & Nat'l. Resources
Fax (202) 224-6163

Subject: S. B. 406

Dear Senators:

I am one of the majority of Alaskans who support the responsible exploration and development of the Coastal Plain of ANWR. I urge you to move forward with legislation to that effect.

Our energy imports are grow at an alarming rate while our proven reserves are being depleted rapidly. The U.S. trade imbalance is due in large part to our energy imports. Our country cannot afford to become more dependant on oil imports then we already are. We cannot permit the OPEC countries the leverage the "oil weapon" gave them earlier in this decade.

Prudhoe Bay now produces about 25% of our domestic petroleum supply. Where would we be now if the naysayers who wanted to block the pipeline had prevailed over responsible development?

ANWR may well hold another super giant field the size of Prudhoe. Leasing stipulations should be developed to ensure that the natural enviroment is protected during exploration and development. To place the coastal plain in a wilderness status while its potential is unknown would be very irresponsible.

Sincerely,

J. Dennis Stacey

ASSOCIATED BUILDERS AND CONTRACTORS, INC.

ARCTIC NATIONAL WILDLIFE REFUGE (ANWR)
MANTON AMENDMENT

ISSUE: Should the federal government dictate that contractors working on privately-funded projects abide by the terms and conditions set forth in labor contracts (wages, benefits, etc.) even though they are not signatory to such agreements.

BACKGROUND: Due to the unrest in the Middle East, the problems in the Persian Gulf, and an uncertain oil supply, the United States has become increasingly aware of the critical need to tap domestic energy resources. Legislation now pending in the U.S. Senate, S. 406, introduced by Senators Bennett Johnston and James McClure, would permit the exploration, development and leasing of a small segment of the Arctic National Wildlife Refuge (ANWR) under leases from the federal government.

During consideration of the bill in the previous Congress, the House Merchant Marine and Fisheries Committee added the "MANTON AMENDMENT" language which would require all construction and maintenance work associated with development and production in ANWR to be performed under the terms and conditions set forth in unspecified local or national collective bargaining agreements. This would establish for all ANWR construction maintenance work a unique set of government requirements not found on any other public or private sector projects. While disguised as requiring the payment of "prevailing wages," this amendment is not an extension of the Davis-Bacon statute -- it calls for the union wage, not the prevailing wage. Indeed this amendment goes further in applying a federally mandated wage to construction projects which are not federal or federally-assisted projects.

IMPACT: IF enacted the MANTON amendment would:

- compensate all laborers and mechanics in accordance with applicable collective bargaining contracts negotiated by building trades unions;
- eliminate nonunion competition for ANWR projects as subcontractors must abide by the terms of the general's collective bargaining agreement;
- force nonunion employees to seek employment through the union hiring hall, and to join building trades unions within seven days;

729 15th Street, NW • Washington, DC 20005 • (202) 637-8800

- o escalate construction costs on ANWR projects by mandating union — not prevailing — wages and work conditions for construction and maintenance;
- o increase costly litigation by imposing terms of the labor contract negotiated by local or national building trades' unions on all ANWR contractors;
- o establish unprecedented Congressional mandate to impose collective bargaining agreements on non-signatory contractors and workers and mandate the payment of union wages for private sector projects in the absence of a union contract.

LEGISLATIVE STATUS:

The Manton Amendment was added to the ANWR legislation, H.R. 3601 in the 100th Congress. However, the bill was never reported to the House or Senate Floor and died with the end of the Congress.

S. 406 was introduced by Senator Bennett Johnston (D-LA) on February 9, 1989. Hearings are scheduled in the Senate Energy and Natural Resources Committee for March 6 and Senate Floor action is expected prior to June 1st. Similar legislation is anticipated in the House of Representatives.

POSITION:

ABC strongly favors passage of S. 406 to permit energy development in the Coastal Plain of the Arctic National Wildlife Refuge in Alaska. Current U.S. energy trends underscore the importance of finding more oil and natural gas resources here at home. The Department of the Interior has identified the ANWR coastal plain as "the Nation's best single opportunity to increase significantly domestic oil production." Oil production operations can be carried out without harm to the arctic ecology or wildlife, as evidenced in the production at Prudhoe Bay on Alaska's North Slope.

ABC opposes the attachment of a "MANTON" amendment which would dictate payment of union wages and collective bargaining agreements on nonunion contractors. This would represent an unprecedented extension of federal control over private sector wage and work rule determinations. As the MANTON amendment would seriously impair the balance of labor relations in the construction industry it would jeopardize the passage of much needed energy legislation.

February, 1989

WILDERNESS IMPACT RESEARCH FOUNDATION
855 SIXTH STREET
ELKO, NEVADA 89801
702-738-2009

A. Grant Gerber
Chairman

FAX MEMORANDUM

TO: The Honorable J. Bennett Johnston FAX: (202-224-6163)
Chairman, Senate Committee on Energy
and Natural Resources

FROM: A. GRANT GERBER

DATE: March 6, 1989

Re: Alaska - ANWR Costal Plans

****

Dear Senator Johnston:

We need Alaska oil and gas.

The oil and gas developments in Alaska appear to be beneficial for wildlife and the wild claims by the preservationists regarding wildlife have no basis in fact.

We urge your support of S.B. 406.

Very truly yours,

A. GRANT GERBER

AGG/ism
cc: Ms. Becky Gay
Resource Development Council

March 7, 1989

The Honorable J. Bennett Johnston
United States Senate
Chairman, Committee on Energy and Natural Resources
Hart Building
Washington, DC 20510

Dear Senator Johnston:

Thank you for scheduling the hearings on SB 406 in your Energy and Natural Resources Committee.

As a private citizen and businessperson in Alaska, I strongly urge your Committee to pass this ANWR legislation. In the long productive operation of the Prudhoe Bay fields, the State of Alaska and the Petroleum Industry have proven to the world that the development of Alaska's Arctic region can be done in an environmentally-safe and economically-sound manner.

The development and production of the ANWR region is not only important to the economic welare of the State of Alaska, but it is critical in America's overall plan for energy independence.

Your support of this legislation is gratefully appreicated.

Respectfully,

Gail Phillips

Gail Phillips
P.O. Box 3304
Homer, Alaska 99603

OFFICE OF THE PRESIDENT

SENATOR TIM KELLY

P.O. BOX V
JUNEAU, ALASKA 99811
(907) 465-3822

P.O. BOX 210001
ANCHORAGE, ALASKA 99521
(907) 561-7612

March 6, 1989

The Honorable J. Bennett Johnston
United States Senate
Chairman, Committee on Energy and Natural Resources
Dirksen Building
Washington, D.C. 20510

Dear Senator Johnston:

Thank you for scheduling hearings on SB 406 in your committee.

The development of the coastal plain of ANWR in Alaska is critical, not only to the economic welfare of the State of Alaska, but also for energy independence for our Nation.

Major advances in Arctic oil field technology and the proven success of the Prudhoe Bay field will insure the environmentally-sound development of ANWR.

I would respectfully request that each member of your committee consider the positive passage of SB 406, and pass the legislation that will open the Coastal Plain of ANWR to responsible energy development.

With appreciation,

Tim Kelly

TIM KELLY
Senate President

TK:gp

THE NATIONAL CATTLEMEN'S ASSOCIATION
THE NATIONAL COUNCIL OF FARMER COOPERATIVES
THE NATIONAL GRANGE
PUBLIC LANDS COUNCIL

March 6, 1989

The Honorable J. Bennett Johnston
Senate Energy and Natural Resources Committee
136 Senate Hart Office Building
Washington, D.C. 20510

Dear Senator Johnston:

We are writing to request your support for S. 406, a bill to authorize competitive oil and gas leasing and development of the Coastal Plain of the Arctic National Wildlife Refuge (ANWR). Through your leadership we can help provide the nation and the important agricultural interests we represent with a secure supply of domestic energy.

Development of our domestic energy resources is essential to providing a prudent and recoverable limit on our growing dependence on insecure sources of imported oil. Adequate and secure supplies of energy are critical if American agriculture is to continue to meet the nation's demands for food and fiber. Nearly 80% of the energy used in agricultural production is derived from petroleum. Petroleum based fuels have been an important contributor to the dramatic gains in agricultural productivity during this century.

Attached is an article that was featured in the November 1987 issue of Arctic Notes, a publication of the Coalition for American Energy Security. We are sure you will find it helpful as it clearly outlines our organizations' concerns with regard to our nation's energy future.

We urge you to support S. 406. It is the kind of initiative needed to help us meet our future energy needs.

THE NATIONAL CATTLEMEN'S ASSOCIATION

By: Bud Eppers
Bud Eppers, Chairman
Public Lands Committee

THE NATIONAL COUNCIL OF FARMER COOPERATIVES

By: Tom Van Arsdall
Tom Van Arsdall
Vice President
Agricultural Inputs & Services

THE NATIONAL GRANGE

By: Leroy Watson
Leroy Watson
Legislative Representative

PUBLIC LANDS COUNCIL

By: Jim Magagna
Jim Magagna, Vice President

RURAL AMERICA AND OIL

By

THE NATIONAL CATTLEMEN'S ASSOCIATION
THE NATIONAL COUNCIL OF FARMER COOPERATIVES
THE NATIONAL GRANGE
AMERICAN SHEEP INDUSTRIES ASSOCIATION
THE PUBLIC LANDS COUNCIL

For farmers, ranchers and other residents of rural America, secure sources of domestic energy at reasonable prices are important concerns. After the shortages and price increases of 1973 and 1978, this connection should be obvious. This is why our coalition of agricultural and rural organizations supports the expeditious opening of ANWR's Coastal Plain to environmentally sound exploration, development and production of its petroleum resources. The Coastal Plain represents the best on-shore oil and gas prospect in the United States, with potential reserves equal to Prudhoe Bay.

Closing the Coastal Plain by designating this area wilderness is contrary to the long-standing principle of multiple use of Federal lands. Congress has long directed that public lands provide opportunities for recreation, wildlife management, and responsible use of natural resources. The fact is that we can protect environmental values in this area and others and still develop our natural resources to provide for America's needs.

Petroleum and natural gas prices, both directly and indirectly, are among the largest components of the cost of production on our nation's family farms and ranches. A $10 a barrel increase in the cost of oil above today's levels could place many of America's farmers in a severe cost/price freeze. Discouraging the exploration for and production of domestic petroleum resources, such as a moratorium on oil and gas exploration on the ANWR Coastal Plain, will expand OPEC's market power and will increase our vulnerability to disruptive embargos and higher consumer prices. This is not in the best interests of agriculture, our balance of payments, or our national security.

Energy emergency preparedness remains a very real and pressing national priority. Nearly half of this nation's oil needs are met through imports, with dependence on imports projected to rise. Development of domestic resources is a key ingredient in responding to the economic drain of such imports,

as well as the continuing threat of possible disruptions.

While rural Americans understand the benefits of oil and gas development, we also have first-hand knowledge of the risks inherent in such exploration and production. For decades, most of the exploration and production of this nation's oil and natural gas has occurred in rural America. This nation's small towns and rural communities have benefitted from jobs and economic activities associated with oil and gas development. But those same towns and communities have also borne a disproportionate share of the environmental risks associated with oil and gas development.

To better manage and weigh the risks and benefits of oil and gas development, local and national farm and landowners' associations have negotiated with petroleum development and exploration companies for years. These rural landowners ask tough questions of the people who want to develop their property. Educational efforts on both sides and innovative technical solutions were often needed to allow oil and gas drilling to occur in areas of this country as environmentally sensitive as anything on the ANWR Coastal Plain. Few rural families are willing to gamble with the long-term agricultural productivity of their private property for the relatively short-term agricultural profits from oil and gas development until their concerns are adequately addressed.

We have consistently endorsed appropriate policies to pursue the responsible development of domestic energy resources. The Coastal Plain of the Arctic National Wildlife Refuge in Alaska should be explored, and its potentially huge energy resources developed, in an environmentally sound manner. Certainly the experiences gained in the development of Prudhoe Bay and the Trans-Alaska Pipeline clearly demonstrate that such an undertaking can occur without harming the environment.

The fate of rural America is intertwined with the adequacy of this nation's natural resources, including oil and natural gas. We believe that this nation's energy policy should allow and encourage the reasonable development of our domestic oil and natural gas resources in an environmentally sound manner.

THE NATIONAL CATTLEMEN'S ASSOCIATION is a non-profit trade association representing approximately 230,000 professional cattlemen throughout the nation, including individual members, 48 affiliated state cattle associations, and 23 affiliated national breed organizations.

THE NATIONAL COUNCIL OF FARMER COOPERATIVES is a nationwide association of cooperative businesses which are owned and controlled by farmers. Through its direct membership, the National Council represents about 90 percent of the nation's local farmer cooperatives, with a combined membership of nearly 2 million farmers.

THE NATIONAL GRANGE was the first general farm and rural affairs organization in the United States. Today the Grange represents 335,000 family farmers and other rural residents through its 4,000 local chapters in 41 states.

AMERICAN SHEEP INDUSTRIES ASSOCIATION is a non-profit trade association representing approximately 115,000 wool and sheep producers in 34 state and regional associations.

THE PUBLIC LANDS COUNCIL represents the 27,000 western ranchers who graze cattle and shep on Bureau of Land Management and Forest Service Lands in the 13 western states. The Council coordinates public policy of the National Cattlemen's Association, the National Wool Growers Association and The Association of National Grasslands.

* * *

The above article was printed in the November, 1987 issue of "ARCTIC NOTES", a publication of the Coalition For American Energy Security.

COALITION FOR AMERICAN ENERGY SECURITY

M. Isabelle Tapia
Executive Coordinator

March 6, 1989

The Honorable J. Bennett Johnston
Chairman
Senate Energy and Natural Resources
Committee
136 Hart Senate Office Building
Washington, D.C. 20510

Dear Chairman Johnston:

Enclosed to be included in the hearing record of March 6, 1989 on ANWR before the Senate Energy and Natural Resources Committee are the testimony of the Coalition for American Energy Security as well as the testimony of other members of the Coalition.

I and the members of the Coalition urge you to make the Coastal Plain of ANWR available to help meet our national energy needs. American oil imports are rising steadily while domestic production stagnates. We need to reverse this trend. Opening the Coastal Plain of ANWR to oil exploration and drilling is a big step in this direction. Legislation to open the Arctic Coastal Plain now is needed so that we can realize the potential of ANWR in a timely manner. To do so will benefit all of America and represents the best course for our nation.

Please give ANWR development your support.

Sincerely,

M. Isabelle Tapia

1050 Thomas Jefferson Street, N.W. – Sixth Floor, Washington, D.C. 20007 (202) 333-7484

MEMBERSHIP: Alaska Oil & Gas Association • American Association of Petroleum Landmen • American Institute of Merchant S... • American Petroleum Institute • American Trucking Associations • Americans for a Rational Energy Policy • Arctic Slope Regional Corporation • The Associated General Contractors of America • Association of Oil Pipelines • BP North America • Brown & Root, Inc. • Chevron U.S.A. Inc. • Cooper Industries, Inc. • Crowley Maritime • Dresser Industries, Inc. • Fluor Corp. • Highway Users Federation • Independent Petroleum Association of America • International Association of Drilling Contractors • International Association of Geophysical Contractors • Joint Maritime Congress • Marriott Corporation • NAACP - Anchorage Branch • National Association of Home Builders • National Association of Manufacturers • National Association of Realtors • National Cattlemen's Association • National Coal Association • National Council of Farmer Cooperatives • National Inholders Association • National Marine Engineers Beneficial Association • National Marine Manufacturers Association • National Gas Supply Association • NL Industries, Inc. • National Ocean Industries Association • National Tour Association, Inc. • National Wood Grower's Association • Petroleum Equipment Suppliers Association • Public Lands Council • Recreation Vehicle Industry Association • Rocky Mountain Oil and Gas Association • The Standard Oil Company • The National Grange • U.S. Chamber of Commerce • Western Oil and Gas Association

STATEMENT
OF
ISABELLE TAPIA
EXECUTIVE COORDINATOR
FOR THE
COALITION FOR AMERICAN ENERGY SECURITY
BEFORE THE
SENATE ENERGY AND NATURAL RESOURCES COMMITTEE
ON THE COASTAL PLAIN OF THE
ARCTIC NATIONAL WILDLIFE REFUGE

MARCH 6, 1989

My name is Isabelle Tapia. I am the Executive Coordinator for the Coalition for American Energy Security. The Coalition was formed for the purpose of informing the American public on the critical policy significance of the future status of the Coastal Plain of the Arctic National Wildlife Refuge (ANWR) to America's national security and energy independence.

The Coalition has a broad, representative national base. We currently represent 54 organizations, companies, trade associations, labor unions and other groups who are deeply concerned about America's declining domestic oil production and our nation's growing dependence on insecure sources of foreign crude oil. A list of the Coalition's current membership is appended to my testimony and is submitted for the record in this proceeding.

The subject of this hearing scheduled by the Senate Energy and Natural Resources Committee is of national and international significance. This significance must be measured in terms broader than domestic energy policy and fish and wildlife administration. It must be understood and recognized that,

ultimately, the subjects addressed in this hearing have important ramifications for foreign policy, national security, the American economy and international trade.

The nations of the Middle East are major players in international affairs today because of their levels of crude oil production, their huge oil and gas reserves and their ability to control prices. Recent industry reports indicate that an average of 720,000 b/d of crude is being exported from Saudi Arabia, once again our largest foreign crude oil supplier. We have been caught by surprise before, and will be again if we do not act now to minimize our dependence on foreign oil, especially from the unpredictable Persian Gulf and the Middle East. Such heavy reliance on oil imports weakens the U.S. economy, exports American jobs, hurts our balance of payments and seriously undermines our national security. Opening the Coastal Plain area of ANWR to development, under reasonable and prudent environmental regulations, will benefit all regions of the United States by resulting in greater domestic production.

U.S. oil production has dropped to its lowest level in 25 years, while domestic consumption of petroleum products is at a peak for the 1980's and is increasing at about 2% a year. The drop in domestic production and the rise in consumption have increased demand for imported petroleum. Oil imports in the United States were up 24% in 1986 compared to 1985 and, on an annual basis, are now approximately 42% of total U.S. consumption. By the early 1990's imported oil will account for over 50% of domestic demand.

Today, Prudhoe Bay and Alaska's North Slope provides nearly 25% of the nation's total domestic crude oil production. Last year Prudhoe Bay produced its six billionth barrel of oil. This means more than one-half of the proven 10 billion barrels of recoverable oil has been produced and that our nation's largest oil field in North America has or will begin its decline. This oil must be replaced by more domestic production or by imports. All Alaska North Slope oil is used for domestic consumption. In the future, the 1.5 million acre Coastal Plain has the potential, if it is opened, for enabling Alaska's North Slope to continue to provide a major alternative to imported oil and a very substantial contribution to our nation's petroleum needs.

The Coastal Plain of ANWR contains the nation's most highly prospective area for major "Prudhoe Bay class" discoveries of oil and gas. The public lands of the Coastal Plain are located on Alaska's North Slope near Prudhoe Bay and the Trans-Alaska Pipeline. Very significant oil and gas discoveries have been made both to the east, in onshore and offshore Canada, and to the west of the Coastal Plain, at Prudhoe Bay. All knowledgeable observers, including an independent geologist in a consultant report for the National Wildlife Federation, agree that this small (by Alaska standards) 1.5 million acre area represents the nation's best prospect for discovery of one or more new "Middle East class" oil reservoirs.

Given the huge potential of the small 1.5 million acre Coastal Plain study area for major new discoveries of critically needed domestic crude oil, we believe it would be irresponsible

to designate this area as wilderness. It is conceivable that if the 1.5 million acre Coastal Plain is opened to responsible, properly regulated leasing, exploration and development, it will enable Alaska's North Slope to continue to provide a major domestic alternative to imported oil and rising balance of payments.

While this is a national issue, the future of the Coastal Plain of ANWR may also affect your states directly. Attached to my statement is a map which shows that a conservative $10.5 billion was spent on Alask North Slope development throughout the United States between 1980 and 1986.

The Coastal Plain presents the Congress and the nation with an opportunity to take early, well planned, strategic steps to avoid undue reliance on insecure foreign sources for imported oil; an opportunity to "act" rather than "react" to the needs of the American people.

On behalf of our Coalition's 54 members who support opening the Coastal Plain of ANWR, I urge the Members of the Senate Energy and Natural Resources to support legislation to open the Coastal Plain to responsible development. We oppose designating the area as wilderness.

The membership of the Coalition for American Energy Security believes that making the Coastal Plain of ANWR available for oil and gas leasing is responsible energy policy and a matter of vital concern to American consumers and to the most vital interests of the United States.

COALITION FOR AMERICAN ENERGY SECURITY

MEMBERSHIP

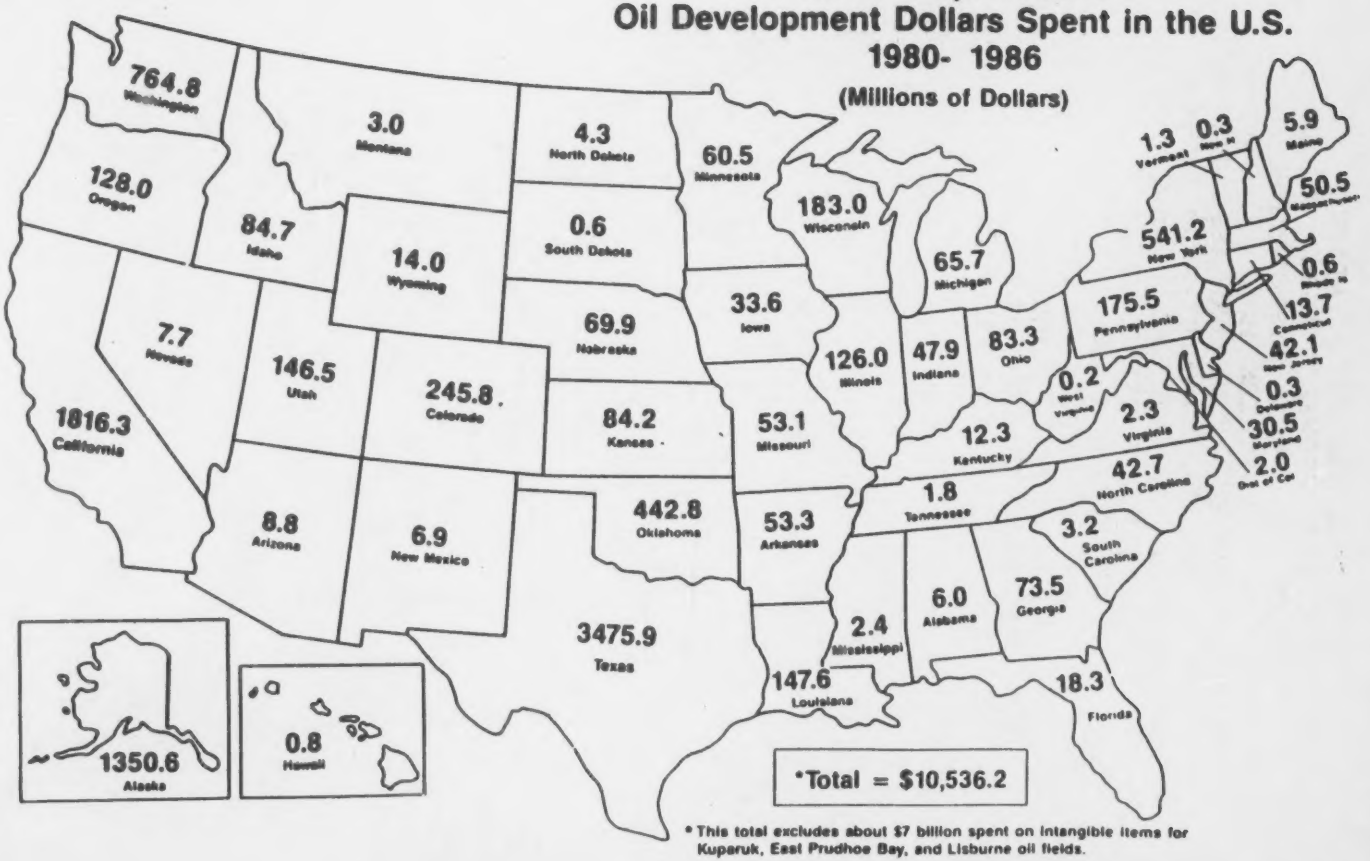
ALASKA OIL AND GAS ASSOCIATION
AIR TRANSPORT ASSOCIATION
AMERICAN ASSOCIATION OF PETROLEUM LANDMEN
AMERICAN PETROLEUM INSTITUTE
AMERICANS FOR A RATIONAL ENERGY POLICY
AMERICAN INSTITUTE OF MERCHANT SHIPPING
AMERICAN MINING CONGRESS
AMERICAN TRUCKING ASSOCIATIONS
ARCTIC SLOPE REGIONAL CORPORATION
ASSOCIATED BUILDERS AND CONTRACTORS
ASSOCIATED GENERAL CONTRACTORS OF AMERICA
ASSOCIATION OF OIL PIPELINES
BP NORTH AMERICA
BROWN & ROOT INC.
CATERPILLAR INC.
CHEVRON U.S.A. INC.
COLUMBIA HELICOPTERS INC.
COOPER INDUSTRIES, INC.
CROWLEY MARITIME
DRESSER INDUSTRIES, INC.
FLUOR CORPORATION
HEHR INTERNATIONAL INC.
HIGHWAY USERS FEDERATION
INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA
INTERNATIONAL ASSOCIATION OF DRILLING CONTRACTORS
INTERNATIONAL ASSOCIATION OF GEOPHYSICAL CONTRACTORS
INTERSTATE NATURAL GAS ASSOCIATION OF AMERICA
JOINT MARITIME CONGRESS
MARRIOTT CORPORATION
NAACP-ANCHORAGE BRANCH
NATIONAL ASSOCIATION OF HOMEBUILDERS
NATIONAL ASSOCIATION OF MANUFACTURERS
NATIONAL ASSOCIATION OF REALTORS
NATIONAL CATTLEMEN'S ASSOCIATION
NATIONAL COAL ASSOCIATION
NATIONAL COUNCIL OF FARMER COOPERATIVES
NATIONAL INHOLDERS ASSOCIATION
NATIONAL MARINE ENGINEERS BENEFICIAL ASSOCIATION
NATIONAL MARINE MANUFACTURERS ASSOCIATION
NATIONAL OCEAN INDUSTRIES ASSOCIATION

NATIONAL TOUR ASSOCIATION
NATIONAL WOOL GROWER'S ASSOCIATION
NATURAL GAS SUPPLY ASSOCIATION
NL INDUSTRIES INC.
PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION
RECREATION VEHICLE INDUSTRY ASSOCIATION
ROCKY MOUNTAIN OIL AND GAS ASSOCIATION
THE STANDARD OIL COMPANY
THE NATIONAL GRANGE
THE TRANSPORTATION INSTITUTE
U.S. CHAMBER OF COMMERCE
U.S. HISPANIC CHAMBER OF COMMERCE
WESTERN OIL AND GAS ASSOCIATION

96-379 O - 89 - 30

North Slope Alaska
Oil Development Dollars Spent in the U.S.
1980- 1986

(Millions of Dollars)



* This total excludes about $7 billion spent on intangible items for Kuparuk, East Prudhoe Bay, and Lisburne oil fields.

ARCTIC NOTES

News from the Coalition for American Energy Security

January/February, 1989

GUEST COLUMN

Increasing National Security Through ANWR

by Henry Schuler

In addressing the vital links between national security and a prompt investigation of the oil potential of the Arctic National Wildlife Refuge (ANWR), there are two considerations:

- First, the threat posed to America's security interests by insecure or inadequate energy supplies is much more broad than is generally recognized, and
- Second, that threat is much more imminent than many people believe.

History has repeatedly demonstrated that the overall threat to national security is not solely from occasional burdens upon military preparedness encountered during supply disruptions.

But the threat also emerges from a variety of ever-present burdens experienced even when foreign supplies are available -- and which can only be minimized by maintaining domestic output on a continuing basis. Included in this latter category is the preservation of:

- Diplomatic flexibility through avoidance of exporter leverage over foreign policy;
- Superpower parity through minimizing the Soviet advantage in domestic output;
- Alliance cohesion through limiting disruptive competition for the world's available exports;
- Financial stability through reduction of trade imbalances and exchange rate vulnerability; and
- Economic growth through avoidance of erratic oil prices.

If we are to meet the very real threats to these non-military interests, we must avail ourselves of non-military defenses, principally the development of secure domestic petroleum resources.

The second point which I wish to emphasize is my belief that the non-military threats posed by growing dependence upon Middle Eastern oil are likely to become a clear and present danger much more quickly than econometric forecasters predict.

Therefore, we simply cannot postpone the difficult decisions such as exploring ANWR because we cannot count on a gradual tightening of world oil supplies -- and adequate warning -- which would allow us to work at a more leisurely pace.

This sense of urgency reflects my conviction that the oil exporters of the Middle East and North Africa will reassert control over world oil supplies in the near future, and that they will, of course, use that control to further their political and economic interests.

In order for that region to control world oil and raise prices, three conditions must exist. First, those exporters must dominate world oil trades. Second, they must have the desire to manipulate output to assert control. Third, they must have the

(continued on page 2)

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ON CAPITOL HILL

101st Congress Takes Up ANWR Debate

The 101st Congress hit the ground running on the debate surrounding the opening of the Arctic National Wildlife Refuge for oil development. On the first day of the session bills proposing development (HR 49) and preserving the area as wilderness (HR 39) were introduced.

Few expect these will be the only measures introduced on what was one of the most hotly debated topics last Congress.

With a new administration in town, a new secretary at the Interior Department, and a new lineup on the Senate Energy and Natural Resources Committee, many believe the debate could extend beyond this session.

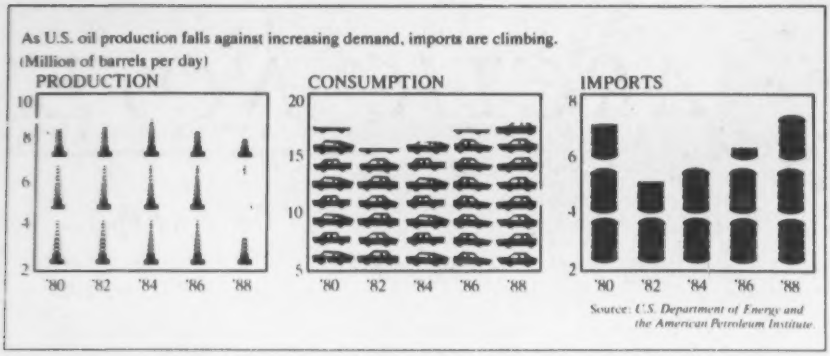
Some participants dub the Reagan administration's proposed fiscal 1990 budget overly optimistic in assuming passage of a development bill before this summer.

For despite the introduction of over half a dozen ANWR bills last year and numerous hearings on the proposals, legislation did not reach the floor of either the House or Senate.

Beyond the "Wilderness/Development" debate other issues present include environmental requirements, labor amendments, proposed land trades between native groups and the Interior Department, the division of lease payments and royalties, and the development of a national energy plan.

In his confirmation hearing before the Senate Energy Committee, Interior nominee Manuel Lujan emphasized the department's commitment to protecting and enhancing the nation's

(continued on page 4)


As U.S. oil production falls against increasing demand, imports are climbing.
(Million of barrels per day)
PRODUCTION
CONSUMPTION
IMPORTS
'80 '82 '84 '86 '88
Source: U.S. Department of Energy and the American Petroleum Institute.

(continued from page 1)

discipline to follow through. Those conditions are not as far away as most people think.

Domination --or the capacity to dominate--is already there. The Middle East and North Africa provided over half of the world's imports last year, retained 85% of the world's installed but unutilized production capacity and possessed 70% of the world's proved reserves.

The second prerequisite for control is determination and desire to manipulate output in a way which allows them to raise world oil prices.

There has always been a basic conflict between attempting to raise revenues through high volumes or through high prices. The disagreement is most appropriately viewed as just one component -- albeit perhaps the most important component -- of an overall Middle Eastern policy dispute between those who seek to accommodate Western, especially American, interests and those who wish to confront our interests.

Although some are sanguine about the relaxation of tensions in the region following the cease-fire in the Gulf War, I fear that development will merely permit a foreclosing of attention on Arab-American disputes which have previously proved intractable. As a result of those developments, I suspect that the confrontational approach of the 1970s will return.

The third element required for regional control of world oil is discipline. Since discipline is an attitude, it is not easy to define; however, it seems to require the existence of four preconditions:

- First, it requires a clear-cut objective, purpose, and goal.
- Second, it requires an assertive set of strategies and tactics that is designed to achieve that goal.
- Third, there must be self-restraint that is based upon an individual sense of self-interest and a collective sense of equity.
- Finally, there must be leadership which is based on either fear or respect.

We are frequently told that OPEC is incapable of disciplining itself, but the evidence for that is entirely based upon OPEC during the first part of the 1980s when Saudi Arabia was attempting to establish its leadership and its volume-oriented policies within the Middle East. Whether we like it or not, this combination met none of the four prerequisites.

If the Saudi attitude should change as the result of internal and external pressures for higher revenues, or if Saudi Arabia should choose to play a less assertive role as it did in the 1970s, the new situation seems to me much more likely to promote discipline.

If we cannot guarantee access to oil from the Middle East and North Africa at an accommodational price, then we should limit our dependence upon imports from that area. We must seek Western Hemisphere sources of oil, especially those which are available in the United States. The Arctic National Wildlife Refuge offers the most promising prospect for a major new discovery in an area where environmentally acceptable operation has been demonstrated and facilities are already installed.

Nor can we wait to determine whether ANWR's promise can be proven by the drill-bit because development will require a decade, and there is every reason to believe that the Middle East will be making greater political and economic demands long before 10 years have passed.

Mr. Schuler is the director of the Energy Security Studies Center for Strategic and International Studies.

Published by:
The Coalition for American Energy Security

For additional copies or further information, please contact:

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Executive Coordinator
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Sixth Floor
Washington, D.C. 20007
(202) 333-7484

Oil Development Is A Learning Experience

By Ed A. Wright, Associate Editor, Harris Publishing

As the Standard Alaska charter flight made its approach to Deadhorse airport near Prudhoe Bay on Alaska's North Slope, I was struck by the immense amount of land below. Several Eastern states could fit here with land left over. Prudhoe Bay looked like a small oasis of buildings and facilities in a vast, featureless sea of white -- untracked, undeveloped, non-accessible, non-populated white.

The plane touched down on the short runway and the thrust reversers nearly put me into the back of the front seat. As we taxied toward the terminal, I could see miles of tundra and a small community that pailed in size to the surrounding country. There were a few drab buildings and piles of snow covered junk off in the distance at the edge of town. This, I would later find out, was the worst the "Slope" had to show. It was the initial development of the Prudhoe Bay oil fields in the late 1960s and early 1970s. My host told me the junk was left by "grab and go" support companies that received little oversight from the state in the early stages of development. Now, the major oil concerns were clearing it up at their own expense, on their own initiative, she said. One oil company executive said that despite Alaska having three times the average for state employees, it claimed it did not have the staff back then to oversee the smaller support companies.

I walked down the rear stairs of the Boeing 727 onto the snow-covered tarmac armed with a briefcase stuffed with facts and figures. The first thing that greeted me on the ground was the penetrating arctic wind that probably blows for six months from one direction and then six months from the other.

The purpose of this trip was to find out if warnings and doomsaying by the environmental groups was founded or if it was simply a red-herring thrown out to guise anti-development anywhere, save-it-because-I-want-it-feelings. Oil development on the North Slope has been a learning experience for the oil companies, by their own admission. But the problems that have been left by early development efforts aren't monumental ones that have left irreparable harm. A little tidying up is what is in order.

A visit to the newly developed oil field of Endicott Island gives one the impression of a clean, down-to-business, well run facility. Oil is extracted from the ground and shipped 850 miles south via the Trans-Alaska pipeline to Valdez. Every factor of environmental impact mitigation seems to have been integrated into the design and operation of the facility.

What 20 years of development on the North Slope has shown, at both the drab oil buildings at Deadhorse and the new gleaming facilities at Endicott, is that wildlife and the environment cycles are independent of the development. Development on the Arctic Slope has not wielded the destructive impact that the environmental groups have claimed. The area affected by development -- that now produces more than 25 percent of all domestic oil -- is a mere fraction of a percent of the total land area.

Now, promising oil development property is being considered to the east of Prudhoe Bay at the northeast corner of the Arctic National Wildlife Refuge. While America takes for granted its ability to fill its gas tanks with affordable gasoline, the same environmental groups that drive to protests in cars are claiming that development of the area by "ruthless" and "crass" developers would mar the Arctic Slope forever. ANWR, as it is known, is a vast plain of tundra with inland mountains ringing its lower flank. It is roughly one-third the size of the entire state of Colorado. The area targeted for exploration, the 1002, is about the size of the metro Denver area plus a little more. The land that would be affected by oil development would be roughly the size of one Denver community. Yet, environmental advocates claim that developing the oil potential would "forever" ruin the entire arctic ecosystem. They use the "F" word (forever) with reckless abandon.

I call it the "last frog on the last lilly pad in the last pond in the last meadow" fund raising syndrome. The facts do not bear out the environmentalist's claims of Arctic ecological holocaust. But incomplete data and alarmist claims do raise great deals of money for the "cause."

ANWR is not alone in Alaska land issues. Mining and exploration is now at a near standstill due to pickish environmental regulations and endless environmental litigation.

One might say these are only Alaska issues. Such an attitude is likened to the man who sees his neighbor being gored by an ox, only to stand back and say "glad it's not me." Alaska is our land just as much as Colorado, Idaho or Florida. Alaska's fight would be our fight. Just as environmental groups know no boundaries and put aside parochial interests to accomplish their goals and fulfill their agenda, so must we.

The next tank of gas we put in our on-trail vehicle may have been refined from Prudhoe Bay oil. The next deck we build at our house may be built from Tongass cedar. The track on our snowmobile may have been made from synthetic rubber a product of - you guessed it-- Prudhoe Bay oil. And the molybdenum that is an alloy on your motorcycle's frame may have come from Alaska, too.

There are beautiful parts of Alaska that we may never see simply because there is no way to get to them. Accessible recreation areas, in a state larger than two Texases combined, can be counted on our fingers and toes.

Suddenly, when you think about it, Alaska's issues are our issues.

CALENDAR OF EVENTS

February 22	Senate Energy and Natural Resources Committee - Confirmation hearing of James D. Watkins to be Secretary of Energy ; 10:00a.m., SD-366
March 2	Coalition meeting : Hall of States, 444 North Capitol St., N.W. Second Floor, Room 209-211, 2:30 p.m.. The guest speaker will be Governor Cowper.
March 6	Senate Energy and Natural Resources Committee: ANWR hearing, 9:30 a.m., SD-366

(continued from page 1)

resources while still proceeding with environmentally sound development.

The former congressman from New Mexico added that the department also hoped to encourage harmony among competing interest groups.

Under questioning by committee Chairman J. Bennett Johnston (D-LA), Lujan said the department opposes further land trades, and would support Congress in killing any legislation allowing trades.

The confirmation hearing also provided a forum for those opposing ANWR development, with Sen. Tim Wirth (D-CO) advocating conservation and the use of alternative resources before development.

A roundup of predictions on ANWR's progress in committees shows:

- The Senate Energy Committee hopes to report a bill out before the summer.

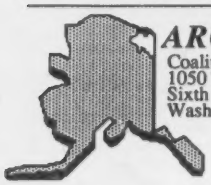
- The Senate Environment and Public Works Committee is less sure of movement. Some members expressed concerns regarding the Interior Department's environmental impact statement. Senate Majority Leader George Mitchell (D-ME) and Sen. Quentin Burdick (D-ND) are seeking commitments for the study of alternative resources and conservation methods.

- The House Merchant Marine and Fisheries Committee staff expects a bill to be introduced shortly which will be very close to the bill reported out of committee last Congress. There continues to be concern among some committee members over environmental impacts and the need for alternative energy plans.

- The Interior and Insular Affairs committee is divided on how many more hearings are needed before acting on the issue. Some members want to wait for the new secretary of the interior to review the issue.

MEMBERSHIP

Alaska Oil & Gas Association, American Association of Petroleum Landmen, American Petroleum Institute, Americans for a Rational Energy Policy, American Institute of Merchant Shipping, Arctic Slope Regional Corporation, Associated Builders and Contractors, Associated General Contractors of America, Association of Oil Pipelines, American Mining Congress, American Trucking Associations, BP North America, Brown & Root, Caterpillar Inc., Chevron U.S.A., Cooper Industries Inc., Crowley Maritime, Dresser Industries, Fluor Corp., Hehr International Inc., Highway Users Federation, Independent Petroleum Association of America, International Association of Drilling Contractors, International Association of Geophysical Contractors, International Gas Association of America,Joint Maritime Congress, Marriott Corporation, NAACP - Anchorage Branch, National Association of Home Builders, National Association of Manufacturers, National Association of Realtors, National Cattlemen's Association, National Inholders Association, National Marine Engineers Beneficial Association, National Marine Manufacturers Association, National Coal Association, National Ocean Industries Association, National Tour Association, National Wool Growers Association, Natural Gas Supply Association, NL Industries, Petroleum Equipment Suppliers Association, Public Lands Council, Recreation Vehicle Industry Association, Rocky Mountain Oil and Gas Association, The Standard Oil Company, The National Grange, Transportation Institute, U.S. Chamber of Commerce, U.S. Hispanic Chamber of Commerce, and the Western Oil and Gas Association.



ARCTIC NOTES
Coalition for American Energy Security
1050 Thomas Jefferson Street, N.W.
Sixth Floor
Washington, D.C. 20007

ANWR
BACKGROUND

a. Interior Department Recommendations
b. Background on ANWR
c. Questions & Answers
d. Editorials
e. Organizations that Support Exploration and Development
f. Terminology

RECOMMENDATION OF THE SECRETARY OF THE INTERIOR
TO
THE CONGRESS OF THE UNITED STATES
APRIL 1987

I recommend the Congress direct the Secretary of the Interior to conduct an orderly oil and gas leasing program for the entire 1.5-million-acre 1002 area at such pace and in such circumstances as he determines will avoid unnecessary adverse effects on the environment.

* The Secretary should be given authority to establish requirements for oil and gas operations that allow them to proceed in an economically reasonable manner but avoid unnecessary adverse effects on the 1002 area's wildlife, habitat, and environment.

* Competitive leasing authority should be granted to the Secretary to delegate as he believes proper, and should be similar to that used to lease the National Petroleum Reserve in Alaska. The Secretary should also have authority to decide such issues as unitization, drainage, diligence, and lease terms and management.

* The Secretary should be granted authority to suspend or terminate any leases in the 1002 area at any time, in the same manner prescribed by the Outer Continental Shelf Lands Act as amended. If leases are terminated for reasons beyond the control of the operators/leassees, operators/leassees should be compensated in a manner similar to that prescribed by the Outer Continental Shelf Lands Act as amended.

* The Secretary should have the authority to require lessees to restore the leased tract to protect environmental values to the extent reasonably possible and desirable.

* The Secretary should be granted authority, which supersedes ANILCA Title XI, to grant rights-of-way and easements across 1002 area lands for oil-and gas-related activities and facilities. This authority must allow the Secretary to require siting and modifications of proposed facilities to avoid unnecessary duplication of roads and pipelines.

* All geological and geophysical data acquired with respect to the 1002 area should be shared, upon request, with the Secretary who should ensure its confidentiality.

In light of the extensive environmental analysis done to prepare the final report/LEIS, I recommend that it be adopted statutorily as the programmatic EIS for a leasing program for the 1002 area.

Because Section 1002(i) of ANILCA withdrew the 1002 area from operation of the mineral leasing laws, and Section 1003 prohibited "leasing or other development leading to the production of oil and gas" in the area "until authorized by an Act of Congress," specific legislation must be enacted to implement my recommendations.

In recommending that Congress enact legislation to open the 1002 area for oil and gas leasing, I also recommend that Congress enact legislation to open the Kaktovik Inupiat Corporation (KIC)/Arctic Slope Regional Corporation (ASRC) lands within the Arctic Refuge to similar activities.

The ASRC's right to develop and produce any oil and gas which may underlie the KIC/ASRC lands within the Arctic Refuge is, by virtue of the 1983 Chandler Lake Exchange Agreement, expressly contingent upon Congressional authorization of oil and gas leasing or development and production within the 1002 area, or on the KIC/ASRC lands specifically.

Selection Of Preferred Alternative (Alternative A)

I have selected Alternative A, Full Leasing, as my preferred alternative for management of the 1002 area, after evaluating carefully the five alternatives in Chapter nV of the final report/LEIS, pursuant to the requirements of the National Environmental Policy Act. I believe that Alternative A best meets the Nation's goals and responsibilities.

Before selecting this alternative, I considered the information presented in the final report/LEIS, the draft recommendation of the Assistant Secretary for Fish and Wildlife and Parks, comments and information received during the public-comment period, and consultations with the Government of Canada.

I have considered the 1002 area's unique opportunity to provide potentially enormous quantities of domestic oil, in light of America's increasing dependence on imported. Oil production from the 1002 could begin at a time when America's largest producing field, Prudhoe Bay, will be diminishing. I also have considered the potential $79 billion to $325 billion contribution to the Nation's economy from development of the 1002 area's estimated oil resources, as well as the favorable effects on our balance of trade and national security.

In addition, I evaluated the potential effects of developing these potential hydrocarbon resources on the wilderness, wildlife, and subsistence values of the coastal plain. Many commenters indicated the need and desire to conserve the significant environmental values of the 1002 area. Public comment also overwhelmingly supported opening the area for oil and gas development. My recommendation reflects my firm belief, based on demonstrated success at Prudhoe Bay and elsewhere, that oil and gas activities can be conducted in the 1002 area in a manner consistent with the need and desire to conserve the area's significant environmental values.

Our ability to conduct oil exploration, development, and production in a careful and environmentally sound manner is a factor leading me to designate Alternative A as the environmentally preferred alternative. This conclusion is based on the environmental impacts of substitute sources of energy. The Department of the Interior's analysis of these impacts, described in Chapter VI of the final report/LEIS, concludes that each of the available substitute possibilities involves a large measure of environmental harm. Also, in the event of a future energy crisis, there would be strong pressure to develop rapidly, promising areas like the 1002 area, without regard for environmental factors.

# # #

1064C

BACKGROUND FACT SHEET: ANWR COASTAL PLAIN7

The Arctic National Wildlife Refuge (ANWR) is part of the federal system that, as of September 30, 1987, included 442 refuges located throughout the United States. By far the largest acreage is in Alaska, where 16 wildlife refuges cover more than 77 million acres -- about 90 percent of the nation's total wildlife refuge area. Of the Alaskan acreage, 19 million acres lie within ANWR. (Another 5.2 million acres have been set aside by the state in conservation units.)

I. Where is the ANWR Coastal Plain7

The 19-million acre Arctic National Wildlife Refuge (ANWR) lies in the northeast corner of Alaska. It is bordered on the north by the Beaufort Sea, on the east by the U.S.-Canadian border and on the northwest by the Canning River. The entire refuge lies north of the Arctic Circle and includes a wide range of topography from the relatively flat frozen tundra on the northern coastal plain to the inland Sadlerochit, Shublik, Phillips Smith and Romanzof mountains southward to the southern edges of the Brooks Range.

The Coastal Plain -- the area believed to contain the greatest potential for significant discoveries of crude oil and natural gas -- comprises the northernmost section of ANWR. Containing 1.5 million acres, less than 8 percent of the total refuge area, the Coastal Plain lies south of the Beaufort Sea and between the Canning and Aichilik rivers.

On ANWR's northern edge are the 92,000 acres -- abutting the Beaufort Sea about midway between the Canning River and the Canadian border -- owned by the Kaktovik Inupiat Corporation (KIC).

II. Facts About the ANWR Coastal Plain

* At its widest points, the Coastal Plain (the area in which the petroleum industry is interested) is about 100 miles across and about 30 miles deep and covers an area slightly larger than the state of Delaware.

* Along the coastal area, the plain is an almost featureless expanse -- barren and dotted with thousands of unconnected small ponds; the area to the south becomes gently rolling treeless hills which merge into foothills and then into the northern edges of the Brooks Range.

* There is a Native population of about 200 residents at Kaktovik -- a village on Native-owned lands at Barter Island, adjacent to the coastal plain and within the boundaries of ANWR.

* The 75.4 million acres of National Wildlife Refuges in Alaska would comprise the 4th largest state in the U.S. Comparatively:

Arizona	72.9 million acres
New Mexico	77.8 million acres

* The Coastal Plain of ANWR with 1.5 million acres would be the 49th largest state:

Delaware	1.3 million acres

* If ANWR was a state it would be larger than 10 other states:

1.	ANWR	19.0
2.	West Virginia	15.5
3.	Maryland	6.6
4.	Vermont	6.1
5.	New Hamshire	5.9
6.	Massachusetts	5.3
7.	New Jersey	4.9
8.	Hawaii	4.1
9.	Connecticut	3.2
10.	Delaware	1.3
11.	Rhode Island	.7

* Yet the ANWR Coastal Plain comprises only 8 percent of the entire refuge, an area of 1.5 million acres. Less than one percent of the Coastal Plain would be affected by oil and gas activity.

III. ANWR And America's Energy Future

The ANWR Coastal Plain is believed to be rich in petroleum. Although little oil and natural gas exploration has taken place, limited seismic surveys have been made and an exploratory well was drilled on Native Alaskan land southeast of Barter Island. The Coastal Plain also lies between two known major discovery areas. Some 45 to 90 miles west of ANWR, the Prudhoe Bay, Lisburne, Endicott and Kuparuk oil fields are currently in production. Approximately 2 million barrels of oil a day are produced from these fields. Several other discoveries have been made along the Beaufort Sea at Milne Point, Point Thomson and Seal Island. To the east of ANWR, major discoveries have been made in Canada near the Mackenzie River Delta and in the Beaufort Sea.

According to the 1980 U.S. Geological Survey Open-file Report 80-916:

All of the potential petroleum of ... (ANWR) ... is thought to be in the Coastal Plain portion. This Coastal Plain area lies on the intersection of several major geological trends and has characteristics of both the Prudhoe Bay and Mackenzie Delta petroleum provinces.

The U.S. Department of the Interior (DOI), in its April 1987 final report on the oil and gas potential of the 1.5-million acre ANWR Coastal Plain, estimates that there are billions of barrels of oil to be discovered on the Coastal Plain. DOI estimates that, under different geological and economic assumptions, "recoverable resources" range from 600 million to 9.2 billion barrels of oil. The "in-place resources" range from 4.8 billion to 29.4 billion barrels. Recoverable resources are those which are economically producible using today's technology. In--place resources is the total amount of oil thought to be in the reservoir -- some of which will not be economically recoverable.

Several important points should be understood concerning these DOI estimates:

* First, there is uncertainty inherent in all oil and gas exploration methods which do not include actual drilling. Section 1003 of the Alaska National Interest Lands Conservation Act (ANILCA) prohibited DOI from drilling but permitted seismic and other surface surveys under Section 1002 of ANILCA. However, the data gained in the exploration that has taken place forms an adequate basis for the conclusions of the report.

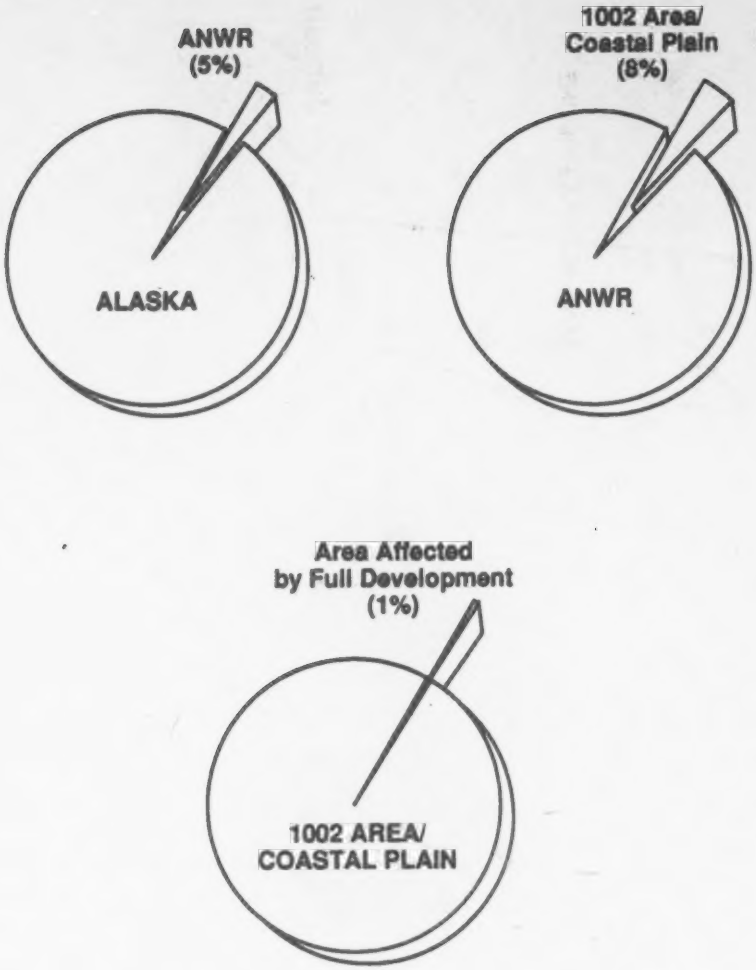
* Second, Interior Department estimates indicate a very large crude oil potential, which maybe on the same order of magnitude as the nearby Prudhoe Bay field, the largest U.S. discovery to date.

* Finally, the ANWR Coastal Plain provides one of the best opportunities this nation has in the next 10 to 15 years to replace the decline in Alaskan production -- oil supplies which would otherwise have to be replaced from foreign sources to fuel this country's economy.

It is essential, therefore, that lands having high petroleum potential -- such as those within the ANWR Coastal Plain -- be made available for environmentally sound exploration and production operations.

If the ANWR Coastal Plain were opened to exploration and development, and significant commercial discoveries of crude oil were made, production could begin around the year 2000. This newly-found oil could make a significant contribution toward off-setting the decline in existing fields -- both on the North Slope and in the lower-48 states.

That new oil could help lessen America's future dependence on imports and reduce the effects of any future cutoff in the flow of imported oil during political and military disturbances. Thus, the crude oil and natural gas resources of the ANWR Coastal Plain could provide an "insurance policy" against future disruptions, such as those accompanying the 1973-74 Arab oil embargo and the 1978 Iranian revolution.


ANWR
(5%)
ALASKA
1002 Area/
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Area Affected
by Full Development
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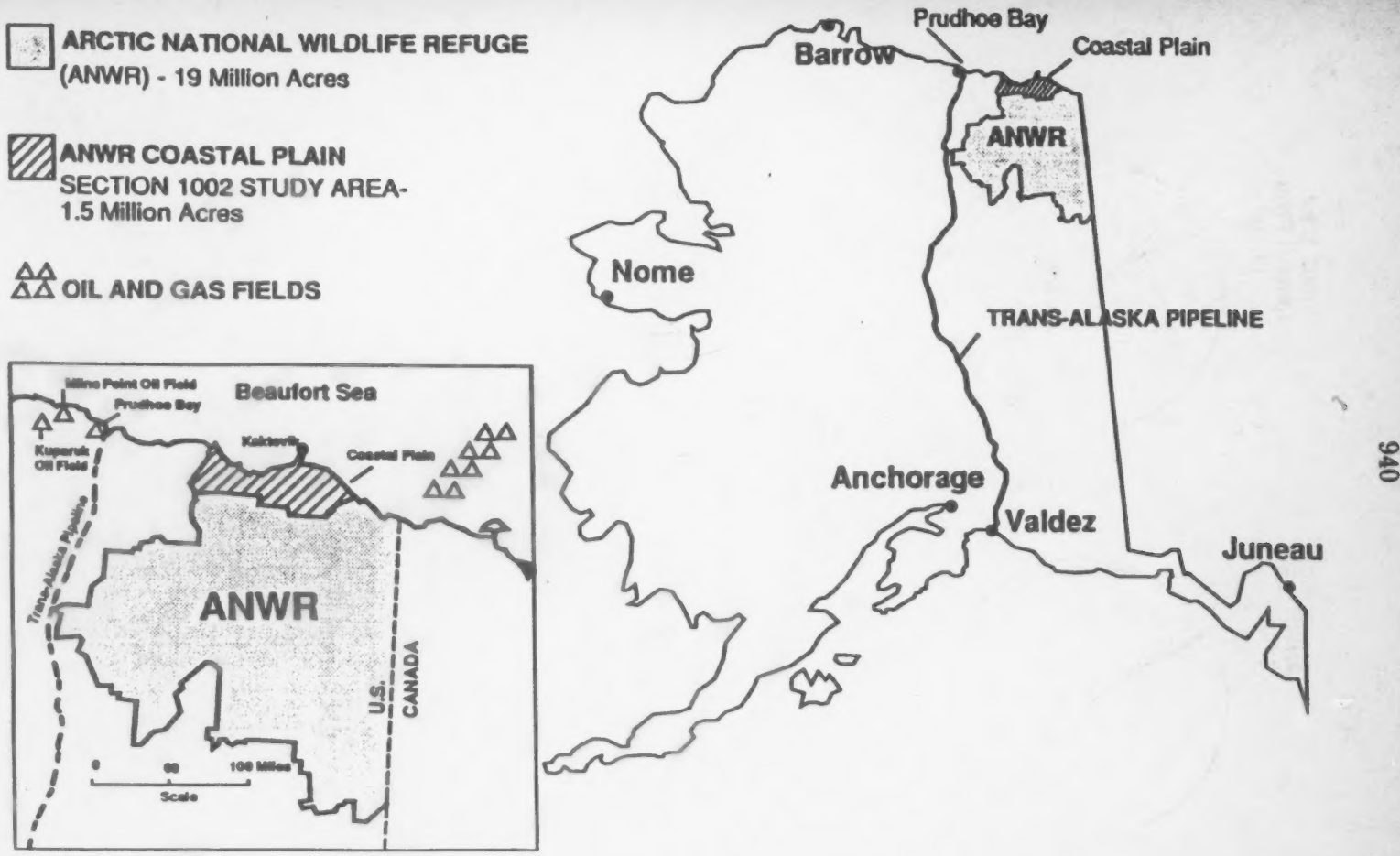

ARCTIC NATIONAL WILDLIFE REFUGE
(ANWR) - 19 Million Acres
ANWR COASTAL PLAIN
SECTION 1002 STUDY AREA-
1.5 Million Acres
OIL AND GAS FIELDS
Milne Point Oil Field
Prudhoe Bay
Kuparuk
Oil Field
Beaufort Sea
Kaktovik
Coastal Plain
Trans-Alaska Pipeline
ANWR
U.S.
CANADA
0
50
100 Miles
Scale
Prudhoe Bay
Barrow
Coastal Plain
ANWR
Nome
TRANS-ALASKA PIPELINE
Anchorage
Valdez
Juneau

ANWR
QUESTIONS & ANSWERS

1. WHAT IS THE STATUS OF LEGISLATION TO OPEN THE COASTAL PLAIN OF THE ARCTIC NATIONAL WILDLIFE REFUGE (ANWR) TO OIL AND GAS EXPLORATION AND DEVELOPMENT?

Although ANWR Coastal Plain legislation was not enacted during the second session of the 100th Congress, significant progress was made. Similar legislation is be considered again in 1989.

In 1988, both the Senate Energy and Natural Resources Committee and the House Merchant Marine and Fisheries Committee reported bills to open the coastal plain to oil and gas development. However, Congress adjourned without taking further action on the measures, and new legislation has been introduced in the 101st Congress, which convened in January.

During 1987-1988, a total of 35 hearings or markup sessions on ANWR Coastal Plain leasing were held by the Senate Committee on Energy and Natural Resources, the Senate Committee on Environment and Public Works, the House Committee on Interior and Insular Affairs. Leasing legislation favoring opening the ANWR Coastal Plain was approved by the Senate Energy and Natural Recources Committee (S. 2214) and the House Merchant Marine and Fisheries Committee (H.R. 3601). Neither bill received floor action. The Subcommittee on Water and Power Resources of the House Interior and Insular Affairs Committee, which also considered ANWR legislation, did not conclude action on either H.R. 3601 or other ANWR legislation.

2. The U.S. INTERIOR DEPARTMENT ESTIMATES THAT IN THE ARCTIC NATIONAL WILDLIFE REFUGE (ANWR) 1002 AREA THERE IS LESS THAN A ONE-IN-FIVE CHANCE OF DISCOVERING ANY ECONOMICALLY RECOVERABLE OIL RESERVES AND ONLY A ONE-IN-TWENTY CHANCE OF FINDING A FIELD THE SIZE OF PRUDHOE BAY. GIVEN THESE LONG ODDS, IS THIS AREA REALLY WORTH DEVELOPING?

The odds are always long in the search for domestic energy supplies. But if the U.S. oil industry doesn't take the calculated risks necessary to replace the nation's declining reserves, America will face an unprecedented era of overdependence on oil imports with drastic consequences to its economy and national interests.

New-field wildcat wells in the United States -- wells that are drilled in previously unexplored areas -- find new major discoveries of oil about one time out of every 50 wells, which represents a 2 percent success rate.

The success rates reflect industry experience almost entirely in the Lower 48 states. In remote areas of Alaska there has been no drilling and very little geological data has been accumulated. Thus, an industry that has grown accustomed to finding major fields 2 percent of the time with its wildcat drilling programs (those in areas far removed from any previous drilling) views a 19 percent chance of finding economically recoverable oil in the ANWR 1002 area -- especially a chance of finding what may be billions of barrels of oil -- as an excellent opportunity.

The Interior Department estimates that up to 9.2 billion barrels in economically recoverable oil may be found beneath the 1002 area and that the mean amount of expected oil would be 3.2 billion barrels. If the department's high estimate of 9.2 billion barrels were to be realized, this would place the 1002 area close to Prudhoe Bay the largest U.S. discovery to date. The mean estimate of 3.2 billion barrels would also be a significant addition to U.S. oil supplies and the third largest oil find in U.S. history.

3. THE DEPARTMENT OF THE INTERIOR DID NOT DRILL A SINGLE WELL IN ITS STUDY OF THE OIL POTENTIAL CRUDE OIL RESOURCES OF THE 1002 AREA. GRANTED, THE SURFACE GEOLOGY LOOKS GOOD, BUT IS THAT ENOUGH TO BE SURE THAT THERE IS ANY PETROLEUM THERE, LET ALONE PRODUCIBLE QUANTITIES?

The Department of the Interior did not drill an exploratory well within the 1002 area, because Congress, in writing the law establishing the Arctic National Wildlife Refuge (ANWR), specifically prohibited any drilling.

Although one cannot be sure whether petroleum will be found without actually drilling, a reasonable estimate of the potential for the existence of petroleum resources was made. The Department of the Interior makes such estimates prior to virtually every offshore federal lease sale and seldom bases them on data obtained by actually drilling within the prospective lease sale area.

Rather, the Interior Department collected a substantial amount of valuable geological data on which to estimate the petroleum resource potential in ANWR. For example, the department considered:

* more than 1,300 line miles of seismic data;

* approximately 1,300 gravity readings;

* field observations and surface measurements conducted by exploration crews, including studies of the known natural surface seeps of oil, such as those at the Katakturuk and Jago rivers;

* carefully crafted maps of the geology of the area; and

* outcrop rock samples collected and analyzed for age and geochemistry (hydrocarbon-generation potential) and porosity and permeability (potential reservoir characteristics).

The Department of the Interior's report on its 1002 area study concludes that data from nearby wells in the Prudhoe Bay area and in the Canadian Beaufort Sea and Mackenzie Delta, combined with the promising seismic data gathered in the 1002 area, indicate extensions of producing trends and other geologic conditions extremely favorable for discovery of one or more giant (reserves exceeding 100 million barrels) or supergiant (reserves exceeding 500 million barrels) oil fields in the 1002 area.

4. DOESN'T IT MAKE SENSE TO SIGNIFICANTLY INCREASE THE U.S. STRATEGIC PETROLEUM RESERVE WITH CURRENTLY CHEAP AND PLENTIFUL FOREIGN OIL, RATHER THAN DRAINING AMERICA OF ITS FRONTIER OIL RESERVES?

Yes, it does make sense to buy oil for the Strategic Petroleum Reserve (SPR). That does not preclude the necessity for leasing the 1002 area. It is not an either/or issue; both are essential to America's energy security, although the objectives are different.

The purpose of the government's SPR is to provide a limited supply of crude oil should a cutoff in oil imports occur. The reserve cannot provide a long-term supply of oil to meet normal demand. Moreover, creating the storage facilities to hold that emergency oil is an expensive and time-consuming process, which adds significantly to the total cost of acquiring and storing the emergency oil supply.

There are currently 550 million barrels of crude oil stored in the SPR -- less than a three-month supply of imported oil at current import rates. That oil just about filled the available capacity of the storage program. It could not provide more than a temporary replacement for foreign oil and could not replace the sharp decline in domestic oil production that is occuring as older U.S. oilfields are depleted of their reserves.

Replacement of those domestic reserves can be accomplished only through new domestic discoveries or increased imports.

In recent months, U.S. oil imports have exceeded 40 percent of demand. According to industry and government estimates, that percentage could rise dramatically, if low prices and overproduction on the world market continue for long. By the year 2000, just 13 years from now, oil imports could account for some two-thirds of total U.S. demand, unless significant domestic oil discoveries are made.

5. THE 1002 AREA ENCOMPASSES MORE THAN 2,300 SQUARE MILES. WHY IS IT NECESSARY TO OPEN ALL OF THAT LAND TO OIL AND GAS OPERATIONS?

Geological surveys and seismic studies indicate that the 1002 area has vast potential for the discovery of significant oil and gas reserves. Only a very small portion of the area would actually be disturbed during exploration and production activities. Based on the experience at Prudhoe Bay -- just 65 miles to the west -- less than 23 square miles would be affected by drilling and production pads, roads, and other facilities. That is less than one-tenth of one percent of the total area of ANWR (30,000 square miles).

If economically significant oil and gas discoveries are made, activities in the area would last only as long as the reserves are producible -- usually on the order of 20 to 30 years. Once exploration and production operations come to an end, the land would be restored.

6. WHAT WOULD BE THE ENVIRONMENTAL EFFECTS OF A LONG-TERM COMMITMENT TO OIL AND GAS DEVELOPMENT, PRODUCTION AND TRANSPORTATION IN THE 1002 AREA?

The area would see minimal environmental impact. The oil industry's 20-year track record on Alaska's North Slope shows that oil and natural gas exploration and development can and do exist in harmony with the environment. The amount of land which would be affected by exploration, production and transportation is less than one-tenth of one percent of the total Arctic National Wildlife Refuge area.

[illegible] would be unlikely to last longer than 20-30 years, a very brief span in man's historical use of the region. When oil operations ceased in the area, all facilities would be removed and the land rehabilitated. If exploratory drilling did not reveal promising oil reserves in the 1002 area, operations would cease and no further development would occur.

If a significant petroleum find resulted, the industry would employ the same protective measures in developing the area that it has used successfully to safeguard the environment in other North Slope oil operations.

For example, the trans Alaska pipeline has been specially constructed to provide caribou the access they need to roam freely throughout their range. The pipeline is fully insulated to avoid melting and damaging the permafrost which support it.

Other environmentally-sensitive techniques that would be used in ANWR include:

* selecting exploration and production sites where they will cause the least adverse environmental impact;

* minimizing the surface area used during exploration and production by consolidating facilities (for example, by using directional drilling technology, many production wellheads may be located on one pad);

* designing water crossings to minimize disturbance of river or stream beds and to prevent obstruction of the water flow; and,

* using vehicles that exert low pressures per square inch on the ground to minimize disturbance of the insulating active layer of tundra.

7. ENVIRONMENTALISTS CHARGE THAT OPENING THE 1002 AREA TO PETROLEUM OPERATIONS COULD HAVE A DEVASTATING EFFECT ON THE MIGRATION PORCUPINE CARIBOU HERD. INDUSTRY CLAIMS THAT THE SMALLER CENTRAL ARCTIC HERD IS THRIVING AMID PETROLEUM OPERATIONS AT PRUDHOE BAY. WHO'S RIGHT?

The arguments made by the environmentalists concerning the effects on caribou of opening the 1002 area to oil exploration and production are virtually the same as those they presented prior to the first Prudhoe Bay area lease sale in 1964. Events have proven they were wrong then and there is no reason to suppose that their arguments today are correct concerning the herds in the neighboring 1002 area.

The Central Arctic caribou herd, which occupies the Prudhoe Bay area throughout the year, has adapted well to petroleum operations on the North Slope. For the most part, the animals freely forage near or cross over or under the pipeline, although some females apparently do avoid the immediate area of the pipeline and other major facilities during calving and post-calving periods.

According to the U.S. Department of the Interior, the Central Arctic herd has quadrupled in size since 1970. That year, the herd numbered about 3,000; in 1978, 6,000; in 1981, 9,000; and, in 1985, 15,000.

The oil industry can utilize the same methods it employed at Prudhoe Bay and along the trans Alaska pipeline route to minimize the impact of petroleum operations on the 180,000 Porcupine caribou that migrate to the 1002 area. The mitigating actions the Interior Department recommends in its report on the 1002 area have nearly all been taken elsewhere on the North Slope and along the pipeline route with significant success. These actions include:

* burying pipelines, where possible;

* where burial is not practical, placing ramps over structures in areas of natural crossings or where development tends to funnel caribou, or elevating the pipelines to allow free passage in areas without ramps;

* reducing vehicle disturbance by limiting the use of the area to essential industry and agency personnel;

* separating roads and pipeline as necessary to make caribou passage easier;

* restricting the seasons when surface activities can take place to minimize disturbance in areas of calving or concentrated use;

* monitoring the size, productivity, movement and general health of the herd and the effect of oil development on caribou, so that other mitigating actions can be taken, if needed;

* allowing free movement of caribou to and in insect-relief areas; and,

* locating facilities away from watercourses and keeping transportation crossing facilities to a minimum.

8. HOW DO THE ESKIMOS, WHO ARE DEPENDENT ON THE FISH AND WILDLIFE IN THE 1002 AREA FOR THEIR SUBSISTENCE ECONOMY, FEEL ABOUT OPENING THE AREA TO PETROLEUM OPERATIONS?

Many Eskimos, including political and business leaders, have expressed strong support for efforts to open the 1002 area to development in an environmentally responsible manner, citing both economic and energy security reasons.

For example, George Ahmaogak, Sr., and Inupiat Eskimo and major of the North Slope Borough, points out that tax revenues from Prudhoe Bay and other oil fields, during the past 10 years, have been the primary source of funds for the building of a comprehensive network of schools, roads, housing and other facilities throughout the borough. Oil revenues have also made it possible for the borough to provide medical care and many other types of services in all of its villages.

Another Eskimo leader, Jacob Adams, who is president of the native-owned Arctic Slope Regional Corporation, agrees, stating that "our land in and near the 1002 area represents the Eskimo people's best chance to participate directly in the economic benefits that North Slope oil development has brought to Alaska."

9. THERE ARE ONLY A FEW STREAMS DEEP ENOUGH TO SUSTAIN FISHLIFE IN THE 1002 AREA. WHAT ASSURANCE IS THERE THAT OIL OPERATIONS WOULD NOT POLLUTE OR DAMAGE THESE WATERWAYS?

The Interior Department has identified eight streams within the 1002 study area that support fish populations. The technology developed and experience gained at Prudhoe Bay and nearby oilfields and in the construction of the 800-mile trans Alaska pipeline are applicable to future petroleum operations within the 1002 area. Application of that technology and experiences by the oil companies will assure protection of the fish and their habitat in the 1002 area.

Among the mitigating actions that can assure that any impacts on fishlife will be minimal are:

* avoiding construction near fish-inhabited streams as much as possible during spawning seasons;

* properly designing and locating roads and pipelines;

* restricting gravel removal and other stream alterations;

* minimizing the number of stream crossings;

* using appropriate containment procedures to prevent any spilled oil or contaminants from reaching the streams and to protect invertebrate and aquatic food plant resources;

* constructing road culverts to reduce the potential for trapping fish lacking overwintering habitats.

The Interior Department report notes that, with appropriate mitigation measures in place, the effects of normal petroleum operations on 1002 area fish would be minor.

1048C

SAN FRANCISCO (CA) EXAMINER, Thursday, April 23, 1987

Oil and the caribou

ENVIRONMENTALISTS ARE raising alarms about the recommendation of Interior Secretary Donald Hodel that a northern coastal stretch of the Arctic National Wildlife Refuge be made available for oil drilling. The proposal should not be rejected automatically as a deadly threat to Alaskan caribou and musk oxen. Congress instead should weigh the plan thoughtfully as a potential contribution to the nation's energy requirements, and consider ways of minimizing the environmental effects.

Exploration of the 1.5 million acres is seen as having only a one-fifth chance of turning up major oil fields. But if this does happen, the find could rival Prudhoe Bay, 100 miles away on Alaska's North Slope, which already accounts for 20 percent of domestic production. Looking toward the day when foreign oil again will be expensive and subject to interruption in periods of international turmoil, the United States cannot afford to ignore such a possible boon to the cause of energy independence.

The fears being expressed for the unique wildlife in that part of the far north are, in many cases, greatly exaggerated, and the effects of oil-drilling can be largely mitigated. Hodel contends the consequences would be "negligible" for grizzly and polar bears, snow geese, wolves and moose. Oil operations do not seem to damage the herds of musk oxen.

The coastal plain is used for calving by the migratory Porcupine caribou herd, and this activity might be displaced. But fears for the caribou in the past have proved to be mistaken. They thrive around Prudhoe Bay, and concern that migration would be blocked by the Trans-Alaska Pipeline turned out to be unfounded.

One advantage of the proposed drilling tract is that the pipeline from Prudhoe Bay to the Gulf of Alaska already is there. No need to replay the long fuss over placing the pipe on the fragile tundra.

Wildlife can and should be protected in the 18.9 million-acre refuge while oil is sought in the coastal sector, and protective measures must be extended if important amounts of oil are found. This could be the useful focus of congressional scrutiny.

SACRAMENTO (CA) BEE, Sunday, May 3, 1987

Oil And Caribou Do Mix

The Department of the Interior is asking for a free hand to open 1.5 million acres on the coastal plain of the Arctic National Wildlife Refuge for oil exploration. Given the administration's environmental record, there's no reason for Congress to go that far. But if the legislators can define sufficient constraints to ensure that this fragile wilderness area will be treated with as much care as possible, Interior's basic proposal to permit pumping in the region deserves support.

Environmentalists are opposed to any development in what they describe as the only undisturbed arctic ecosystem left in North America. They argue that we ought to do more for energy conservation before we begin developing additional sources of supply. Of course they're right that the president's opposition to energy conservation has been short-sighted and self-defeating. But America doesn't face a simple choice between development and conservation: the two go hand in hand.

Interior argues that any oil found on the arctic plain won't be used to supply additional demand anyway. Since the oil companies estimate that it will take 10 to 15 years to tap into this area, oil from the coastal plain will only come on line at about the time that the Prudhoe Bay fields begin to run out. So, the proposal's supporters contend, this development will just replace supplies we're already consuming.

Opponents of the plan have focused on the administration's admission that there's only one chance in five that any recoverable oil will be found here. But that means there's an 80 percent likelihood that the effort will result in no major development of the area. And the U.S. Geological Survey says the probability of finding oil in the coastal plain is greater than in any other potential onshore field in the United States. That's why Congress specifically set this area aside for study of its petroleum potential when it created the 19 million-acre wildlife refuge in 1980.

Within the refuge, environmentalists are specifically concerned with the potential impact of development on the places where the caribou historically come to breed. But the caribou population in the central plain has tripled in size since the Trans Alaska Pipeline was built there a decade ago. And while there are significant differences in the size and migratory habits of those herds and the one along the arctic coast, there's at least some evidence to suggest that the oil companies have learned how to cohabit with the caribou. In any event, if the debate over Interior's proposal devolves into a choice between protecting the caribou and increasing domestic oil production as a hedge against continued dependence on foreign petroleum suppliers, there's not much doubt that the environmentalists would lose.

California's congressional delegation has generally opposed Interior's efforts to expand pumping along the state's coastline, arguing that the risks to public health and the economy of the coastal zone are too great. None of those conditions exist in the case of the arctic coastal plain, where not only the state of Alaska but the Indians who live in the area actively support development. If we don't want pumping in our patch, then we ought to be able to suggest an alternative. And if not 200 miles above the arctic circle, then where else?

THE DENVER (COLO) POST, Thursday, April 23, 198

Drill with care in Alaska

INTERIOR Secretary Donald Hodel has recommended that Congress allow oil exploration in the fragile, wildlife-rich coastal plain that forms part of Alaska's Arctic National Wildlife Refuge. Twenty years ago, such a proposal would have been justifiably spurned because of the risk of environmental damage. But today's more ecologically sensitive search and recovery techniques should encourage Congress to allow the exploration — under strict controls.

Tracks left by 1960s-era exploration crews still scar the tender Arctic tundra. But today's quest for oil is carried out from wide-track vehicles that leave barely a trace. And our experience in building the 800-mile Alaska oil pipeline, which many feared would become a man-made disaster, shows that oil facilities can be built with minimal damage to the land and wildlife.

Many environmental groups still argue that the 34-mile by 100-mile shoreline is so valuable to caribou and other wildlife that it should be preserved in pristine form. But years of seismic study have established that this same strip, sandwiched between Canada's oil provinces and the rich Prudhoe Bay field, also is the richest onshore oil and gas prospect in the United States. It could yield billions of barrels of oil.

And we need that oil. See-saw ing prices and falling domestic production have hammered at the U.S. oil industry. Denver and Houston, both key energy centers, share 30 percent vacancy rates in office buildings and have lost thousands of oil jobs. Imports, once at 30 percent, have soared to 40 percent and still are climbing.

If the U.S. continues becoming more dependent upon foreign oil, we will once again become prey to OPEC. And it is certain that OPEC's present low prices would begin rising with a vengeance in such a seller's market, threatening both our national economy and our national security.

Thus, it's obvious that the Arctic Refuge will be opened to drilling and exploration sooner or later. It would be better to do it now — under careful controls — than to wait until a new 1973-style energy shortage sent the rigs rushing madly into Alaska amid a national frenzy that would override all environmental sensitivity.

Of course, there is much more to a sound national energy policy than just probing Alaska's riches. We should keep on promoting energy conservation, through enforced automobile engine standards and other energy-saving devices, better construction materials and cogeneration of electricity. We also must keep up research into solar energy, synthetic fuels and other alternative sources of energy.

But as the Prudhoe Bay experience proves, we've learned a great deal about how to explore responsibly in the Arctic. And it is clearly better for America to develop a balanced and prudent exploration plan now than to lock up the Arctic shore and risk provoking a new energy crisis that would unlock it in the worst of all circumstances in a few years time.

OMAHA WORLD-HERALD (NE) MONDAY, JULY 27, 1987

Oil Exploration Justified If Environment Protected

Twenty years of drilling for oil in Alaska without any appreciable environmental problems should be enough to show that oil development can exist in harmony with the environment. Congress should keep that in mind as it debates whether to open a small part of the Alaska National Wildlife Refuge for oil exploration.

Federal law prohibits oil and gas development unless the environment is protected. Oil exploration in Alaska's Prudhoe Bay, about 65 miles from the wildlife refuge, has shown that such work can even benefit the environment and wildlife.

Since Prudhoe Bay was opened to oil work, the caribou herd in the area has grown from about 3,000 animals to more than 15,000 animals — a faster rate of growth than some areas without oil development have experienced. The number of muskoxen, birds and fish has remained constant or increased, Interior Department officials report. The increases were accomplished by keeping construction out of sensitive habitat areas, designing pipelines to avoid migration routes and doing most of the construction work during the winter, when some animals hibernate or migrate.

The same kind of precautions could be taken at the wildlife refuge, where less than one-half of 1 percent of the refuge's acres would be affected by the oil work.

A dependable supply of domestic oil is needed to help the United States avoid becoming the target of foreign oil suppliers' attempts to increase the price by restricting supplies. The wildlife refuge has been identified as the outstanding oil and gas frontier remaining in the United States.

Sierra Club officials and other environmental groups have opposed a bill that would allow the development work. Their concern for the preservation of the area is understandable. The refuge is a national treasure that needs to be protected.

But oil exploration doesn't pose the automatic danger that some environmentalists and members of Congress say it does. An environmentally sound oil development plan that would help safeguard the nation's energy future should be supported.

THE COLUMBUS (OH) DISPATCH, Sunday, May 24, 1987

Arctic oil potential

Environmentalists and petroleum interests, bolstered by the Reagan administration, are squaring off in a battle over a new — and one of the last — oil frontiers in the United States.

The Arctic National Wildlife Refuge along the northern coast of Alaska is closed to oil exploration under the terms of a 1980 law pushed through by the Alaska Coalition, a dozen or so environmental organizations.

Oil interests, including Standard Oil Co., have joined forces with the U.S. Department of Interior to open the coastal plain to drilling. They project that up to 9.2 billion barrels of oil could be pumped.

The administration, through the Interior Department, says this will reduce dependence on foreign oil, particularly that acquired from the volatile Middle East; produce royalties for the treasury and realize a net economic benefit for the nation as high as $325 billion.

Environmentalists are adamant. They want oil rigs kept out of the 19-million-acre refuge, which they see as one of the nation's finest. They fear drilling will upset and threaten reproductive activity among the region's 180,000-head Porcupine caribou herd, which migrates between Alaska and Canada, but uses the coastal plain for calving.

To this concern, the oil companies point to the Prudhoe Bay area, west of the wildlife refuge, where drilling has gone on for the past 10 years. During that time, the size of its once-5,000-head caribou herd has tripled.

Spokesmen for the Standard Oil Co. say constraints on drilling would prevent all but minimal damage to the coastal plain area, only a small small portion of which would actually contain drilling rigs.

Successful drilling to the west and by Canadian interests to the north and east suggest a high probability that the coastal plain would be productive.

Balancing environmental interests with the nation's legitimate energy needs often leads to conflict. The issues are seldom as black and white as the proponents and opponents imply.

In northern Alaska, oil interests have a track record. The dire predictions that preceded the Prudhoe Bay drilling failed to materialize. The caribou herd actually thrived while other environmental damage was kept to a minimum.

Oil production in the contiguous 48 states has declined in recent years increasing reliance on foreign sources and setting the stage for a new crisis, should an interruption in that supply and the predictable increase in demand occur.

While an oversupply of oil now exists, decreased exploration and increased demand could tighten supplies dramatically in just a few years. In the best interests of the nation, carefully monitored exploration and production within the Arctic National Wildlife Refuge should be pursued.

The Prudhoe Bay experience suggests that this can be accomplished with minimal damage to the environment. The alternative is a nation increasingly held hostage to a foreign oil supply. Because the process from lease to exploration to discovery to actual production can take 10 to 15 years, prolonged opposition will only compound the nation's error of giving too little regard to its energy self-sufficiency.

THE PITTSBURGH PRESS, SATURDAY, JULY 16, 1988

Oil vs. caribou?

"The caribou love it (the Trans-Alaska Pipeline). They rub up against it and they have babies."

— Vice President George Bush

"We view the (proposal to allow oil exploration in Alaska's Arctic National Wildlife Refuge) as a no-win situation for both the Porcupine Caribou Herd and the people who depend on it."

— Canadian Porcupine Caribou Management Board

Somewhere between these extremes lies the truth about the effect oil drilling in Alaska has on caribou, other wildlife and wilderness values. After letting it lie for several months, Congress has again taken up the task of sorting truth from hyperbole as it considers opening 1.5 million acres of Alaska's Arctic National Wildlife Refuge to oil exploration.

Simultaneously, the House Interior Committee is reviewing a bill that would designate the same coastal plain a wilderness area and thus forever close the option of oil drilling.

The option should be kept open. The chances of a major oil find are too good and the size of the potential strike too great to throw away.

America will need that oil, if not now when prices are low and squabbling OPEC nations are overproducing, then someday.

Even if drilling began immediately, it would be roughly a decade before oil would flow in significant quantities. Wasn't it only 10 years ago that we were all waiting in gas lines?

Concerns about damage to wildlife and environment are valid. They are also substantially addressed both in the bill before Congress and in the drilling techniques proposed by the oil companies. Experience in Alaska's Prudhoe Bay oil field 65 miles to the west has led to significant improvements in technology.

Experience with Prudhoe Bay and the Trans-Alaska Pipeline also should convince reasonable persons that oil development can be especially compatible with caribou.

If Mr. Bush went comically overboard in his assessment, predictions of caribou doom have also gone unfounded. The Central Arctic Caribou Herd has instead thrived in the oil pipeline's presence.

THE FLORIDA TIMES-UNION (JACKSONVILLE, FL) MAY 4, 1988

Arctic oil is needed to disrupt cartel's plans to regain hold

Attempts by the oil cartel to regain its stranglehold on the world are a signal that the United States needs to get more serious about domestic oil, including a potentially huge supply in Alaska.

The U.S. Department of the Interior says the coastal plain of the Arctic National Wildlife Refuge is the best prospect in North America for finding substantial new supplies of oil and natural gas. It could provide 1 million barrels of oil a day from 2000 to 2030.

By that time, the oil find at Prudhoe Bay will be either exhausted or nearly so and a new source will be desperately needed.

Even as oil consumption is rising, domestic production is falling. The result is an increase in oil imports. Only three years ago oil imports amounted to less than one-third of the oil supply. Today they are nearing 40 percent.

The Senate Energy and Natural Resources Committee has approved a bill to open 1.5 million acres of the 19 million acre refuge for oil exploration. The House Merchant Marine and Fisheries Committee, of which U.S. Rep. Charles Bennett of Jacksonville is a member, was marking up the bill yesterday.

Barring a technological leap, the United States and other oil-consuming nations are going to have to pay the piper some day. Two-thirds of the known oil reserves are in the Mideast.

But it would be foolish to get into that position before it is necessary. Increasing domestic oil production is one of the best ways to buy time at this point. Conservation can still be a factor but much of that has been used up in previous squeezes in 1973-74 and in 1979.

One of the warning signs on the horizon is the reported offer of six independent producers to cut oil exports by 5 percent for two months if the Organization of Petroleum Exporting Countries did likewise.

The offer from the non-OPEC producers — Mexico, Egypt, China, Oman, Malaysia and Angola — amounts to about 200,000 barrels a day.

Another new factor was the presence at an OPEC meeting of Kent Hance, a smooth-talking, former U.S. congressman who is a member of the Texas Railroad Commission, which regulates that state's large petroleum industry.

Hance saw his mission as "opening a dialogue" with the cartel, which he called a friendly group that's "glad to have someone from the United States to have a dialogue with."

"We're not in love with OPEC, but we need to have input" into decisions by an organization that controls about 35 percent of the world's oil supplies, he said.

He says OPEC will become increasingly important to the United States in the next decade. He predicted that 65 percent of American oil supplies would be imported by 1992.

OPEC failed to get cooperation with the nonproducing nations but has not given up hope. It will resume efforts at a meeting in Vienna next month.

The best hope is that any agreement might not hold any better than the previous agreements. Cartel members have been unable to avoid cheating each other, which has been of great benefit to consuming nations.

The elements that have subordinated greed will not hold sway forever.

Right now the Saudis are so adamantly opposed to Iran that they are willing to keep the price of their own oil low so that Iran's oil will not bring it enough revenue to escalate its war against Iraq.

On Iran's side the utter irrationality shown in response to the American attack cannot be expected to persist indefinitely. In retaliation for the attack, Iran destroyed an oil-producing facility of the United Arab Emirates. The irrational part of that attack was that Iran had been receiving 50 percent of the revenues of the facility it destroyed.

Oil experts now predict that by about 1990, OPEC will be back in the driver's seat. And we all know what can happen to both prices and availability of oil when that takes place.

America's best energy course is to find, develop and use its own oil for as long as possible.

The most potentially productive oil producing area in the United States is the Alaskan area being considered by Congress.

BIRMINGHAM (AL) POST HERALD, July 12, 1988

Oil vs. caribou?

"The caribou love it (the Trans-Alaska Pipeline). They rub up against it and they have babies."
— Vice President George Bush

"We view the (proposal to allow oil exploration in Alaska's Arctic National Wildlife Refuge) as a no-win situation for both the Porcupine Caribou Herd and the people who depend on it."
— Canadian Porcupine Caribou Management Board

Somewhere between these extremes lies the truth about the effect oil drilling in Alaska has on caribou, other wildlife and wilderness values. After letting it lie for several months, Congress has again taken up the task of sorting truth from hyperbole as it considers opening 1.5 million acres of Alaska's Arctic National Wildlife Refuge to oil exploration.

Simultaneously, the House Interior Committee is reviewing a bill that would designate the same coastal plain a wilderness area and thus forever close the option of oil drilling.

The option should be kept open; in fact, oil exploration should proceed. The chances of a major oil find are too good (estimated at one in five, high by industry averages) and the size of the potential strike too great (up to 3.2 billion barrels) to throw away.

America will need that oil, if not now when prices are low and squabbling OPEC nations are overproducing, then someday. Even if drilling began immediately, it would be roughly a decade before oil would flow in significant quantities. Wasn't it only 10 years ago that we were all waiting in gas lines?

Concerns about damage to wildlife and environment are valid. They are also substantially addressed both in the bill before Congress and in the drilling techniques proposed by the oil companies. Experience in Alaska's Prudhoe Bay oil field 65 miles to the west has led to significant improvements in technology and techniques. For instance, drill pads in the refuge will be able to hold twice the number of wells on half the acreage of the drill pads at Prudhoe.

Experience with Prudhoe Bay and the Trans-Alaska Pipeline also should convince reasonable persons that oil development can be especially compatible with caribou. If Bush went comically overboard in his assessment, predictions of caribou doom have proved even more laughable. The Central Arctic Caribou Herd has instead thrived in the oil pipeline's presence.

Yet environmental groups have incredibly trotted out the same myopic prediction of caribou devastation to oppose oil drilling in the refuge.

BOSTON(MA) HERALD, JULY 19, 1987

A balancing act on oil exploration

WE ALL know that energy-conservation efforts in the United States are lagging. We have only to look at the resurgence in popularity of bigger cars and the long lines of traffic to the Cape on a summer weekend to know that.

Each day this nation, its people and its industries consume 17.5-million barrels of oil, far too much of it imported. Interior Secretary Donald Hodel estimates that, within three to five years, we will be importing more than 50 percent of our oil, thus exposing the country to national-security risks and unanticipated shortages.

Clearly, something must be done to assure our energy future, and despite conservation efforts, oil will need to be a part of the mix for a long time to come.

On all of this, we find common ground with the petroleum industry, which stands ready and eager to drill wherever and whenever the political power structure allows. But it is also there that we part company, for the oil industry is just a little over-eager, not making the careful and considered choices that need to be made by our policy-makers.

"We have to win the public-relations battle on Georges Bank to win on Alaska," said Frank Tivnan, associate director of the Massachusetts Petroleum Council. "Clearly, we need to go both to Georges Bank and Alaska, and to California, too."

Well, lots of luck, Mr. Tivnan. Because as long as the industry fails to distinguish between the enormous energy potential of the Arctic National Wildlife Refuge in Alaska with the fairly nominal potential of Georges Bank, and as long as the industry refuses to do the kind of risk/benefit analysis policy-makers are looking for, how can it expect Congress to make such distinctions?

The Interior Department estimates that should the 19-million-acre Alaskan tract be open to oil exploration and development, the nation stands to gain some 10-billion barrels of oil. Other estimates are nearly triple that figure. The environmental risks are minimal, and if the exploration of Prudhoe Bay is any example, the caribou, about which environmentalists are concerned, are in little danger (in nearby Prudhoe Bay the caribou herd has quadrupled since exploration and drilling began there some 20 years ago).

But off our own shores on Georges Bank, estimates as to the oil potential run only as high as 1-billion barrels, and oil-industry officials say it is likely to be only half that. Keep in mind that of the eight wells drilled in tracts leased in 1981, eight came up dry. Here the risks to the fishing and tourism industry from an offshore spill, however remote that possibility, are enormous.

Congress is holding hearings on the Alaska development and Georges Bank. Interior has scheduled another lease sale for Georges Bank for February 1989, unless Congress votes to extend a moratorium on such arrangements.

At the risk of sounding like those folks who say, to one issue or another, OK, "but not in our backyard," we indeed must say yes to oil exploration — certainly in Alaska, but no, indeed, not in our backyard.

THE SUN (Baltimore, MD), Saturday, April 25, 1987

Oil in Alaska

Environmentalists are caught up in a sky-is-falling frenzy over the prospect of oil drilling on a tiny strip of land in northern Alaska.

The area, a 20-by-100-mile strip, is part of a 19-million acre wildlife reserve in the fragile tundra. In 1960, Congress protected most of the territory by establishing the Arctic National Wildlife Refuge. Eight million acres were set aside as wilderness — forever untouchable by human technology. At the same time, Congress directed the Interior Department to conduct a five-year study of the area's oil-producing potential.

Now comes Interior Secretary Donald Hodel reporting a 20 percent chance that the tiny strip on the Arctic Ocean could be sitting on 600 million to 9.2 billion barrels of oil. He wants Congress to lease drilling rights to find out.

But environmental zealots, long on doctrine and short on cost-benefit considerations, claim the exploration and drilling would tarnish the environment and disturb caribou and musk oxen native to the tundra. Their concerns are overblown.

Interior Department geologists estimate only 15,000 acres of the 1.5-million acre coastal plain would experience surface disturbance. Caribou in that area — plus an area around the facilities the animals deem a safe distance for calving — will be displaced. But there are millions of untouched adjacent acres, and the displacement will not significantly affect the size of the caribou herds. Some scarring of the land is inevitable. But the affected area is minuscule and remote. Environmental regulations and restoration technology can minimize the impact.

These effects must be balanced against the potential economic benefits of exploration. Currently, the United States imports 40 percent of its oil, and low prices have discouraged the development of new sources worldwide. In a few years, production around Alaska's Prudhoe Bay will drop to between 250,000 and 500,000 barrels — from the current 1.8 million per day. By that time foreign production may have slowed further, and sloppiness about conservation could boost demand. Some estimates are that by the early 1990s, OPEC again will be able to dictate prices.

The U.S. needs to make certain that in a pinch it can take care of more of its own energy needs. Drilling on the Alaskan coastal plain is not going to meet the need entirely. But it is a key part of a prudent, forward-looking energy policy. The U.S. has the technology, the regulations and reviews to ensure an efficient, safe and environmentally sound effort. Congress must forge ahead.

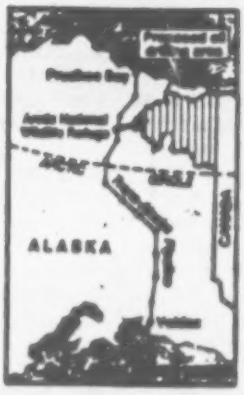
THE NEW YORK TIMES, Wednesday, February 17, 1988, Page A22

Is This Icy Strip Worth $32 Billion?

The frozen Arctic coastal plain of northeast Alaska may hide the largest untapped oilfield in America. Should Congress let the oil companies search for it?

• Interior Secretary Donald Hodel believes that energy from the Arctic National Wildlife Refuge offers a last hope for "preventing ... OPEC from regaining its stranglehold over the American economy." Environmentalist opponents argue that exploration will mutilate a wilderness that shelters caribou, polar bears and other Arctic animals.

• Both sides are indulging in hyperbole. Arctic oil probably won't spell the difference between energy independence and long lines at the gas pumps. Nor is drilling a sure ticket to ecological disaster, as environmentalists assert. There is, however, a good case for a middle way — careful exploitation of what could be a multi-billion dollar resource.



Pinned between the contradictory demands, Congress in 1980 passed the buck. It ordered the Interior Department to weigh the merits of drilling on the Arctic coastal plain. Last spring the department reported that between 600 million and 9.2 billion barrels of oil probably could be recovered from a strip of land some 100 miles long and 20 miles wide.

Environmentalists think the most likely figure is about 3.2 billion barrels, 200 days' national supply, and to them that's not nearly enough to justify scarring the tundra or disrupting the caribou calving grounds. The far better course, they say, is to reduce oil consumption an equivalent amount by conservation. They are pressing to defeat drilling legislation pending this week in the Senate Energy Committee.

To judge from a decade's experience on the adjacent North Slope, oil production can coexist comfortably with Arctic wildlife. But environmentalists are right that building roads and other infrastructure on this frozen desert would inevitably have some lasting effects.

The environmentalists are also right on another point: there are ways to conserve 3.2 billion barrels of oil without great disruption. If conservation is cheaper than buying fuel, though, it is worth accomplishing with or without oil from the wildlife refuge.

How, then, should Congress weigh the potential environmental costs against the economic benefits? The principal answer is that the decision can be made in stages.

Little is risked by the exploratory drilling. If there isn't much oil to be found, the project would be abandoned and the refuge would be secure. Suppose, though, the refuge does contain a vast reserve of, say, 3.2 billion barrels. Suppose, further, that the average cost of getting each barrel to market is, conservatively, just $10 less than the cost of oil purchased on the world market. The total savings would be $10 times 3.2 billion.

Is it worth $32 billion to avoid modest ecological damage to this small strip of tundra? That is 100 times the amount Washington spent in 1986 to acquire land for national parks; it is 10 times the annual budget for the national forests and parks combined. If Congress were to hand $32 billion to environmental groups to invest as they wished, they would have many higher priorities before protection for a sliver of the Arctic National Wildlife Refuge.

Drilling there can't solve America's energy problems, but it might well save the country tens of billions that could be better invested elsewhere. Congressional failure to explore, and only then to exploit the resource, would irresponsibly distort national priorities.

LIST OF COMPANIES/ORGANIZATIONS
SUPPORTING OIL & GAS EXPLORATION AND DEVELOPMENT
OF THE
COASTAL PLAIN OF THE ARCTIC NATIONAL WILDLIFE REFUGE

Alaska Oil and Gas Association
American Association of Petroleum Landmen
American Petroleum Institute
Americans for a Rational Energy Policy
American Institute of Merchant Shipping
Arctic Slope Regional Corporation
Associated Builders and Contractors
Associated General Contractors of America
Association of Oil Pipelines
American Mining Congress
American Trucking Associations
BP America
Brown & Root
Caterpillar Inc.
Chevron U.S.A.
Cooper Industries Inc.
Crowley Maritime
Dresser Industries
Fluor Corp.
Hehr International Inc.
Highway Users Federation
Independent Petroleum Association of America
International Association of Drilling Contractors
International Association of Geophysical Contractors
Joint Maritime Congress
Marriott Corporation
NAACP-Anchorage Branch
National Association of Home Builders
National Association of Manufacturers
National Association of Realtors
National Cattlemen's Association
National Inholders Association
National Marine Engineers Beneficial Association
National Marine Manufacturers Association
National Coal Association
National Ocean Industries Association
National Tour Association
National Wool Growers Association
National Gas Supply Association
NL Industries
Petroleum Equipment Suppliers Association
Public Lands Council
Recreation Vehicle Industry Association
Rocky Mountain Oil and Gas Association
The National Grange
Transportation Institute
U.S. Chamber of Commerce
U.S. Hispanic Chamber of Commerce
Western States Petroleum Council

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ANWR: GLOSSARY OF KEY TERMS

1. **Alaska National Interests Lands Conservation Act (ANILCA):** Passed in 1980, the law nearly doubled the size of the existing refuge, giving it a total of 19 million acres. The law also required the Department of Interior to study the ANWR area to determine whether oil and gas exploration should be allowed. Section 1002 of ANILCA specifically required the Secretary of Interior to report to Congress within five years. The report was released in April 1987 and recommended exploration and development of oil and gas in ANWR.

2. **ANWR Coastal Plain:** The ANWR Coastal Plain, which has not yet been explored, is 1.5 million acres and has been identified as possibly offering the greatest potential for onshore oil in the U.S. The Coastal Plain is a remote, flat, treeless, expanse frozen 9 months of the year.

3. **Arctic National Wildlife Refuge (ANWR)** sits in the northeast corner of Alaska and is comprised of 19 million acres, or 30,000 square miles. The terrain varies substantially over the entire range, including coastal plains, foothills, and mountains.

4. **Arctic Slope Regional Corporation (ASRC):** An Inupiat Eskimo-owned corporation, ASRC has major cultural, subsistence, and economic interests in ANWR and was established pursuant to the Alaska Native Claims Settlement Act of 1971. The village of Kaktovik falls within its operating area.

5. **Caribou:** Man's activities in the Arctic coastal plain have given rise to concerns for potential effects on the caribou herds that migrate across the Arctic coastal plain of the North Slope for about three months out of each year. ANWR is within the main range of the Porcupine Herd (180,000 + animals) and on the periphery of the range of the smaller Central Arctic Herd (13,000 animals), which migrate through Prudhoe Bay and the other North Slope oil producing fields.

6. Kaktovik: The village is located on Barter Island, just north of the ANWR Coastal Plain. It is the only village within the Refuge and has approximately 210 residents, most of whom are Inupiat Eskimos. The Inupiat traditionally have had a subsistence economy. Today their subsistence economy has been partially integrated with a cash system.

7. Musk Oxen: Musk oxen, which had previously become extinct in the area in and around ANWR, were re-introduced in the early 1970's. The herd is still small, numbering only somewhat over 400. However, the musk oxen spend most of their time in the foothills and an adjacent water habitat south of the Coastal Plain where oil and gas activity would not occur.

8. Prudhoe Bay, Kuparuk, Lisburne, Milne Point: Prudhoe Bay was discovered in 1968 by oil companies conducting exploration operations primarily on state lands east of the Colville River. It is the largest oil field in North America, with original recoverable reserves of 9.6 billion barrels.

   Kuparuk, Lisburne and Milne Point are the three other producing fields of the North Slope. Together with Prudhoe Bay, these fields account for about 25 percent of U.S. oil production.

9. Permafrost: The entire Coastal Plain area is underlain by up to 1,500 feet of permafrost, which is permanently frozen water, rock, sand and loose soil. The layer above the permafrost is tundra.

10. Tundra: Tundra is comprised of silt, rocks and vegetation which varies in thickness from a few inches to about three feet. Annually, this layer freezes and thaws to a depth of several feet. The permafrost is susceptible to long-term damage unless care is taken to minimize the effects of man's activities. In the tundra area, off-road traffic movement is limited to that time when the surface is frozen and covered with ice or snow. Special vehicles with large tires that exert little pressure on the surface are used to protect the surface layer.

# # #

1041C

ECONOMIC BENEFITS

a. Trade Deficit
b. Economic Benefits of ANWR Development to the U.S. and to the Individual States
c. Jobs for Americans
d. Maps

ANWR AND THE NATIONAL TRADE DEFICIT

Five successive years of increasing record trade deficits have been viewed by world financial markets as a sign of American economic decline. Although late 1988 trends suggested that the trade deficit may be declining, increasing oil imports would tend to mitigate the improvement and could eventually reverse it.

Oil imports have been one of the largest contributors to this deficit. The cost of U.S. oil imports rose from less than $5 billion per year in the early 1970s to around $25 billion in 1975 and a peak of more than $75 billion in 1980. (For a time in the early 1980s payments for oil imports declined because both imports and prices fell.)

In 1986 and 1987, after prices collapsed, oil imports increased 31 percent, reaching 6.5 million barrels a day. In 1987, oil imports cost the United States an estimated $42 billion, accounting for more than 10 percent of the cost of all U.S. imports. This amount was equivalent to almost 25 percent of the trade deficit. Americans spent twice as much on foreign crude oil as on new Japanese cars and four times as much as on imported iron and steel.

Last year, this nation's trade deficit totaled more than $171 billion. Of that amount, we spent almost $45 billion on imported oil.

If the current trend continues, the U.S. could be importing $150 billion worth of oil by 1995. This would be $15 billion more than the entire trade deficit in 1986.

U.S. oil imports are higher than they need to be because of government policies that prevent development of considerable amounts of oil and natural gas that could be produced economically even at current world oil prices.

If that production were available, current oil imports would be lower. Prudent action by the 101st Congress and the Bush Administration can help realize this potential in the 1990s.

# # #

1068C

ECONOMIC IMPACT OF ALASKA OIL DEVELOPMENT ON THE UNITED STATES

Development of the Arctic National Wildlife Refuge (ANWR) coastal plain could yield a net national economic benefit of more than $150 billion. New jobs, lower balance of trade deficits and increased tax revenues at every government level are just some of the benefits that would reach all 50 states.

* Increased direct and indirect employment. Based on an Interior Department peak production estimate of 659,000 barrels daily (assuming recoverable resources of 3.2 billion barrels), cumulative employment gains from Coastal Plain development could amount to 254,085 jobs. Using the same base projection of production, the gross national product could increase about 0.25 percent above the level that would otherwise exist.

* Greater revenues for the federal government. Using the same base projection of production, the gross national product (GNP) would increase by from 0.14 percent to 1.01 percent above the levels that would otherwise exist;

* Greater economic security through reduced dependence on foreign oil. According to the National Petroleum Council, with a continuing decline in domestic exploration and production, the potential U.S. dependency on oil imports could rise to nearly one-half of total demand by 1990 and to more than two-thirds of U.S. oil needs by 2000; and,

* Improvement in the national trade deficit. Currently, we are spending about $40 billion every year for imported oil. The expenditure is due, in part, to the increase in domestic consumption and the decline in production of domestic oil fields. Experts predict that if the current trend continues, by 1995 the U.S. could be importing $150 billion worth of oil. This would be $15 billion more annually than the entire U.S. trade deficit in 1986.

Since 1977 when production began at Prudhoe Bay -- America's largest oil field -- America has saved $140 billion. But that savings will soon be lost because production at Prudhoe Bay has begun to decline. Unless Congress considers the dangerous trend of increased oil imports, America's trade deficit will continue to grow.

It is estimated that the cost of developing the Prudhoe, Kuparuk, Milne Point, Lisburne and Endicott oilfields -- including some $8 billion spent on the trans Alaska pipeline -- exceeded $36 billion between 1974 and 1986.

Between 1980 and 1986, the major oil companies operating on the North Slope spent more than $10.5 billion in the United States developing those oilfields. Every state in the union participated in supplying goods and services.

If a large field were discovered on the coastal plan and substantial production resulted, large royalty payments would be generated. The distribution of the potential revenues among the federal, state and local governments depends on how the area will be leased, which has not yet been determined. However, the federal share of the bonus money, rents and royalties could help offset declining federal revenues from other fields which have passed peak production.

The present downturn in petroleum exploration and production in the United States, which began in the early 1980s and accelerated rapidly following the sharp decline in crude oil prices in 1986, could seriously impair the nation's goal of greater economic stability and growth. The impact of the downturn continues to be felt throughout the country. Virtually every state in the union has been affected to some degree by the sharp drop in oilfield operations -- some states and institutions far more seriously than others.

Certainly, discoveries of large deposits of petroleum on the ANWR coastal plain would not bring an "instant" end to the problems caused by the present downturn. Nor would it mean that America would no longer need to import oil. But it would go a long way towards securing economic benefits for the United States and securing our energy future.

# # #

1061C

FACT SHEET:
JOBS FOR AMERICANS

Should a major discovery be made, developing the ANWR Coastal Plain would have significant economic impacts on various interests.

Jobs could be created for the nearest residents to the ANWR Coastal Plain, the inhabitants of the Eskimo village of Kaktovik. The village lies just outside ANWR to the north. As Native Americans, this village of 210 residents owns property both outside and within the ANWR Coastal Plain area.

The Arctic Slope Regional Corporation (ASRC), which consists of and represents the natives, has negotiated a contract with Chevron and BP America (Standard Alaska Petroleum) for exploratory drilling on private lands within the area. In 1986, Chevron, as operator, completed drilling operations on the KIC #1 well at a location 14 miles from Kaktovik just outside the Coastal Plain of ANWR.

The North Slope Borough (a borough is similar to a county designation in the lower U.S.) covers a broad area including both the ANWR Coastal Plain and the Prudhoe Bay field further to the west.

Both ASRC and the North Slope Borough support oil and gas leasing in the ANWR Coastal Plain with proper environmental controls. Revenues from North Slope oil development have increased the number of schools, housing, and have provided modernization for the local people.

I. Businesses, industry, and labor in Alaska

Like the development of Prudhoe Bay and the other North Slope fields, a major discovery in ANWR would provide business and labor opportunities in Alaska. The development of the North Slope fields and the trans-Alaska pipeline has provided thousands of jobs in the oil industry and in related and support industries and businesses. North Slope oil development has resulted in major shipping for the maritime industry, which will otherwise decline rapidly in the late 1990's as the fields are depleted.

II. Business, industry, and labor in the U.S.

Development of North Slope oil has resulted in billions of dollars in goods and services in the rest of the U.S. Equipment manufacturers and suppliers have benefited directly through goods and services supplied. Other businesses have benefited indirectly in supplying goods and services for workers and other businesses. The attached map shows how each state has benefited from North Slope oil development.

III. International balance of trade

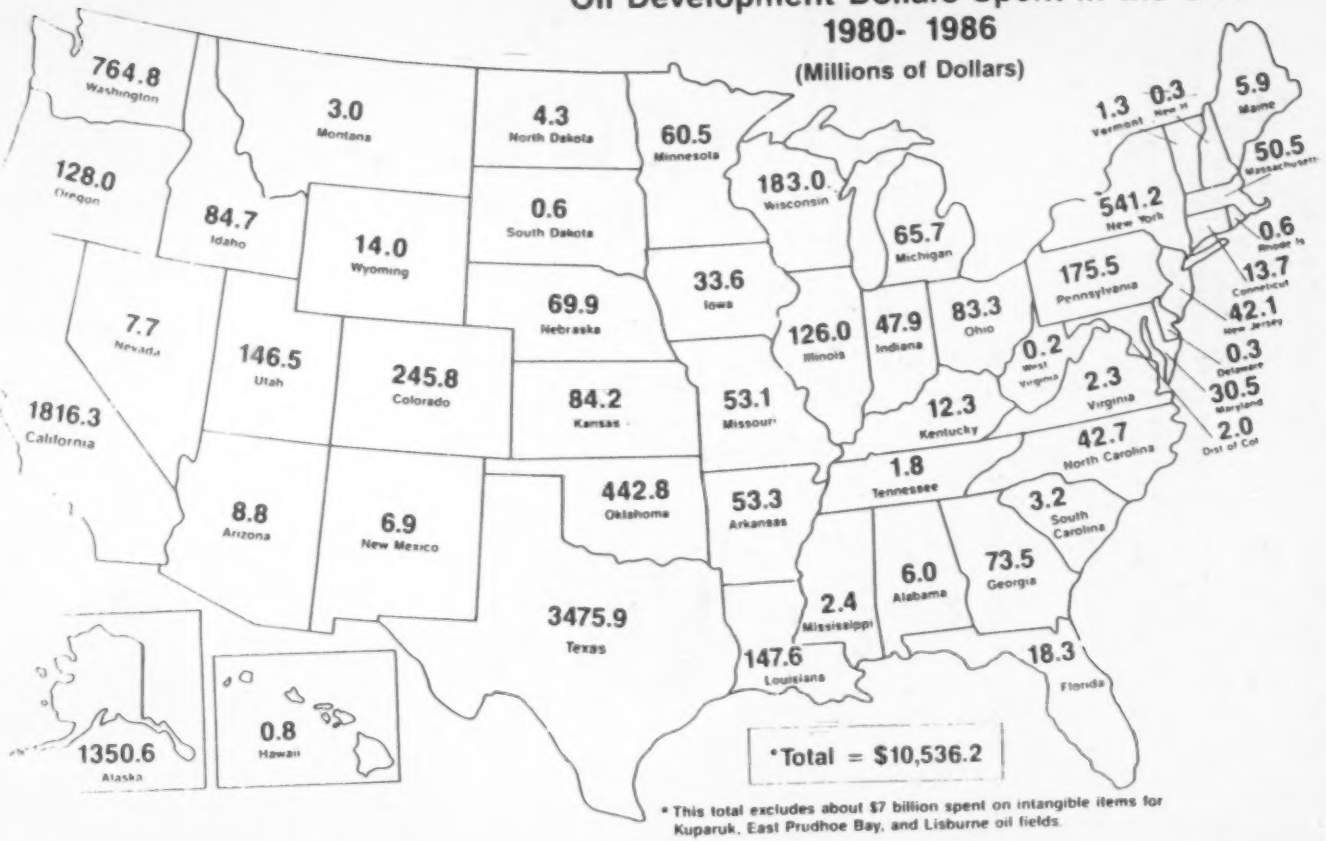
A large portion of the trade deficit is made up of oil imports. Currently, oil imports account for approximately 25 percent of the trade deficit ($44 billion out of $196 billion in 1987). This is projected to increase during the 1990's as domestic oil declines and the percentage of foreign oil increases. The U.S. is not likely to become energy self-sufficient in the near term due to U.S. demands for liquid transportation fuels.

Conservation, alternative fuels, and further development of renewables such as solar, wind, and hydroelectric will help stem the tide of imported oil. However, many alternatives that can be used to supply liquid transportation fuels are not well developed and are more costly than either domestic production or imported oil. The U.S. currently has less than 9 years domestic supply of recoverable oil. A major discovery soon in the ANWR Coastal Plain will add to U.S. oil reserves at the turn of the century when the other North Slope Fields will be producing only about one-third of today's production.

1043C

North Slope Alaska
Oil Development Dollars Spent in the U.S.
1980- 1986

(Millions of Dollars)



* This total excludes about $7 billion spent on intangible items for Kuparuk, East Prudhoe Bay, and Lisburne oil fields.

NORTH SLOPE ALASKA OIL DEVELOPMENT COSTS IN THE U.S. - 1980 - 1986
(Millions $)

	STANDARD	ARCO	CONOCO	TOTAL
Alaska	$1.271.3	$ 79.3	n/a	$1.051.3
Alabama	5.4	0.6	-	6.0
Arizona	8.4	0.4-	-	8.8
Arkansas	1.9	51.4	-	53.3
California	1.723.0	69.5	23.8	1.816.3
Colorado	146.3	99.5	-	245.8
Connecticut	1.1	12.5	0.1	13.7
Delaware	0.1	0.2	-	0.3
District of Columbia	2.0	-	-	2.0
Florida	2.8	15.4	0.1	18.3
Georgia	57.2	16.2	0.1	73.5
Hawaii	0.8	-	-	0.8
Idaho	79.4	0.3	5.0	84.7
Illinois	79.4	46.2	0.4	126.0
Indiana	1.8	45.1	1.0	47.9
Iowa	1.6	30.7	1.3	33.6
Kansas	9.0	75.2	-	84.2
Kentucky	2.4	9.4	0.5	12.3
Louisiana	118.0	28.7	0.9	147.6
Maine	5.6	0.2	0.1	5.9
Maryland	28.0	2.4	0.1	30.5
Massachusetts	15.1	35.2	0.2	50.5
Michigan	8.0	57.3	0.4	65.7
Minnesota	43.5	16.9	0.1	60.5
Mississippi	1.8	0.6	-	2.4
Missouri	23.0	30.0	0.1	53.1
Montana	2.4	0.6	-	3.0
Nebraska	68.9	1.0	-	69.9
Nevada	2.3	5.4	-	7.7
New Hampshire	0.2	0.1	-	0.3
New Jersey	9.5	32.6	-	42.1
New Mexico	6.3	0.6	-	6.9
New York	122.3	415.0	3.9	541.2
North Carolina	1.9	40.3	0.5	42.7
North Dakota	1.8	2.5	-	4.3
Ohio	15.4	67.3	0.6	83.3
Oklahoma	246.7	192.6	3.5	442.8
Oregon	18.9	99.1	10.0	128.0
Pensylvania	25.2	150.0	0.3	175.5
Rhode Island	0.3	0.15	0.2	0.6
South Carolina	2.9	0.1	0.2	3.2
South Dakota	0.1	0.5	-	0.6
Tennessee	0.6	1.25	-	1.8
Texas	2.339.8	1.114.8	21.3	3.475.9
Utah	6.4	139.1	1.0	146.5
Vermont	1.0	0.3	-	1.3
Virginia	1.6	0.6	0.1	2.3
Washington	211.8	506.3	47.5	764.8
West Virginia	0.1	0.15	-	0.21
Wisconsin	8.9	173.6	0.5	183.0
Wyoming	12.5	1.5	-	14.0
TOTAL COSTS	$6.745.0	$3.669.6	124.1	$10.536.2

STANDARD: Total accounts paid to vendors in 1981 - 1986 for West side Prudhoe Bay field $7.003 billion

: Accounts paid to vendors in 1985 - 1986 for Endicott field development $627 million.

: Payments paid to identified U.S. vendors traceable to a ZIP code $6.745 billion.

ARCO : Total payments for tangible items for East side of Prudhoe Bay, Kuparuk and Lisburne 1980 - 1985 $3.669 billion

CONOCO : Payments for goods and services to develop Milne Pt. oilfield, 1983--86 - $124 million.

It is estimated that the cost of developing the Prudhoe, Kuparuk, Milne Pt., Lisburne and Endicott oil fields on the North Slope of Alaska has exceeded $36 billion since 1974. This amount includes the cost of the trans-Alaska pipeline (approximately $8 billion). The fields currently supply 20% of U.S. domestic oil production.

ENVIRONMENT/ TECHNOLOGY

a. Compatibility of the Environment with Oil Development: Environmental Record of the Oil Companies

b. Technological Advances

c. Minimizing the Impact of Development on Wildlife, Water, the Environment

d. Oil Production in Other Wildlife Refuges and Sanctuaries

COMPATIBILITY OF PETROLEUM OPERATIONS WITH THE ARCTIC ENVIRONMENT

Opponents to oil and natural gas leasing of the small Coastal Plain of the Arctic National Wildlife Refuge (ANWR) in northeastern Alaska have alleged that petroleum operations at Prudhoe Bay, some 65 miles to the west, have adversely affected the arctic environment. They charge that Prudhoe Bay operations have caused major environmental problems through oil spills, air pollution and the accumulation of drilling wastes. The allegations, however, are at odds with the facts.

The petroleum industry's 20 years of experience with operations on the North Slope of Alaska provide overwhelming evidence that oil and natural gas exploration, development and production are environmentally acceptable and would pose no threat to the ecology or wildlife of the ANWR Coastal Plain. Stringent federal, state and local regulations and the industry's own standards have prevented major safeguards would protect the ANWR Coastal Plain if oil operations were permitted there.

The oil and gas fields discovered in the Prudhoe Bay area are currently providing one-fourth of all the oil produced in the United States. Based on the Prudhoe Bay experience, less than one-tenth of 1 percent of ANWR -- or under 23 square miles of the 29,688 square mile refuge -- would be affected by oil operations. Disruptions of this small area would be temporary, with the affected areas rehabilitated when operations are completed.

I. Oil spills:

The majority of oil spills at Prudhoe Bay have been small and easily cleaned up. According to the Alaska Department of Environmental Conservation, there were 953 oil spills in the North Slope region during 1985-86, of which 93.1 percent (887 spills) were less than 12 barrels. Of these 887 spills, 64.7 percent (574 spills) were less than 55 gallons. In all the reported spills for this period, only 25 spills totaling 166 barrels reached the tundra, requiring minor restoration measures. During this period, more than one billion barrels of oil were safely produced and pumped south via the trans Alaska pipeline.

II. Air emissions:

Prudhoe Bay air quality consistently meets federal and state standards and is not comparable to that of large cities, such as New York, as opponents have charged. Data from government-mandated monitoring programs prove this. Concern over air pollutants emitted by North Slope petroleum facilities is based on inaccurate information -- quantities of emitted pollutants have been grossly overstated and are based on allowable emissions, not actual emissions, which are much lower. For example, nitrogen oxides emitted at Prudhoe Bay are less than one-fourth of the amount allowed by permit and meet federal new source performance standards.

* According to industry data, air quality at Prudhoe Bay is far superior to that in large U.S. cities, with actual emissions well below legally permissible levels and air pollutants downwind of the Prudhoe Bay oilfield well within the permissible standards set by federal and state governments.

* Comparisons made by critics of ANWR leasing between permissible air pollutant limits for Prudhoe Bay and pollution in large U.S. cities bear no relation to the realities of the North Slope experience. Data from government-mandated air quality monitoring programs clearly show the marked difference in air quality between Prudhoe Bay and large cities in levels of carbon monoxide, ozone, sulfur dioxide and nitrogen dioxide.

For example, although the National Ambient Air Quality Standard is an annual average of 100 micrograms per cubic meter (ug/m3) for nitrogen dioxide, the monthly average concentrations downwind of Prudhoe Bay are consistently below 15 ug/m3. In contrast, levels in the New York City metropolitan area average 68 ug/m3 -- four times greater than on the North Slope. And Washington, D.C., an area virtually devoid of heavy industry, annually averages 74 ug/m3 -- almost five times greater than at Prudhoe Bay.

* Emissions from Prudhoe Bay facilities resulting from the flaring of natural gas make no significant contribution to air pollution, nor are production operations the cause of "arctic haze," as some charge.

* The plant life (primarily lichens and mosses) eaten by caribou has not been damaged by air pollution from production operations on the North Slope.

III. Drilling wastes/muds:

Stringent government regulations and tested industry procedures have ensured that drilling wastes and muds do not pose pollution hazards to the Prudhoe Bay environment. Drilling operations result in three types of wastes: drilling muds, produced water and associated wastes.

Drilling operations produce used drilling muds (natural minerals -- along with small nontoxic concentrations of additives -- that are used to cool and lubricate the bit, maintain well pressure and carry cuttings to the surface for disposal) and cuttings (rock fragments removed by the drill bit). One freeze-thaw cycle, the salts and solids settle out and the water quality of the pit fluids significantly improves. Melting snow contributes additional fresh water which further dilutes these fluids.

Current practice for handling of fluids accumulated in reserve pits involves disposal through injection into deep zones beneath the permafrost. Research is being conducted into other reserve pit designs and alternative disposal methods for muds and cuttings.

Numerous federal, state and local permits must be obtained in order to construct and operate a reserve pit on the North Slope. Required permits include a Clean Water Act permit issued by the U.S. Army Corps of Engineers and a solid waste disposal permit issued by the Alaska Department of Environmental Conservation. The lessons learned at Prudhoe Bay have led the state of Alaska to recently revise its solid waste disposal regulations to impose additional requirements for the design and operation of reserve pits, incorporating provisions for environmental monitoring and specific closure procedures.

IV. Produced water:

Most produced water, which represents the highest volume by-product from oil production, is recycled through injection back into the reservoir to assist in pressure maintenance. Produced water unsuitable for recycling is disposed of through deep well injection that is regulated under the federal Safe Drinking Water Act and by the State of Alaska. Deep well injection is an environmentally sound method of disposal.

On the North Slope, fluids are injected below the zone of continuously frozen ground (permafrost), which extends to as much as 2,000 feet below the surface. Above this zone, only 18 to 36 inches of soil thaw in the short summer period. Fluid migration through the permafrost zone does not occur and water aquifers beneath the zone have been exempted as drinking water sources by the U.S. Environmental Protection Agency because of their high salt content.

V. Effect on caribou:

Concern about acidification of the tundra by facility emissions of sulfur dioxide -- which opponents to ANWR leasing allege would affect the caribou that feed on plant life there -- is also unfounded. The fuel used in the North Slope oilfield facilities is very low in sulfur.

Moreover, only half of the permitted facilities are operating at any time. This explains why, after more than 20 years of North Slope oilfield activity, the average annual ambient air sulfur dioxide content is still below detectable limits. As for the caribou, according to the U.S. Department of the Interior, the herd at Prudhoe Bay has actually increased dramatically over the past several years, growing from some 3,000 animals in 1970 to some 15,000 animals in 1985.

VI. Protecting the Environment on the North Slope:

The experience gained and technology applied during the exploration for and production of crude oil at the Prudhoe Bay, Kuparuk, Lisburne and Endicott fields have clearly demonstrated that such operations are compatible with environmental protection. Moreover, this knowledge and technology are transferable to operations within the Coastal Plain of the Arctic National Wildlife Refuge.

While any activity that takes place in a sensitive environment -- such as that of Alaska's North Slope and Coastal Plain -- will have some effect on that environment, with proper care that effect can be minimized. Such has been the case on the North Slope. Steps taken to protect the North Slope environment include:

* federal and state regulations that limit many of the off-road transportation activities in the tundra area to that time when the surface is completely frozen and snow-covered;

* using vehicles that exert low pressures per square inch on the ground to minimize disturbance of the insulating active layer of tundra;

* limiting most seismic and construction work to the winter months, when the ground is frozen and the snow cover is sufficient;

* completing the drilling and testing of exploratory wells during one winter season, where possible;

* minimizing the number of roads and elevating roadways by the use of gravel pads up to five feet thick;

* placing heated buildings on pillars over gravel pads to allow the air to flow between the buildings and the pads providing isolation from the tundra;

* selecting exploration and production sites where they will cause the least adverse environmental impact;

* minimizing the surface area used during exploration and production by consolidating facilities (for example, by using directional drilling technology, many production wellheads may be located on one pad);

* designing water crossings to minimize disturbance of river or stream beds and to prevent obstruction of the water flow;

* maintaining stringent quality controls over-sewage discharges, including secondary treatments;

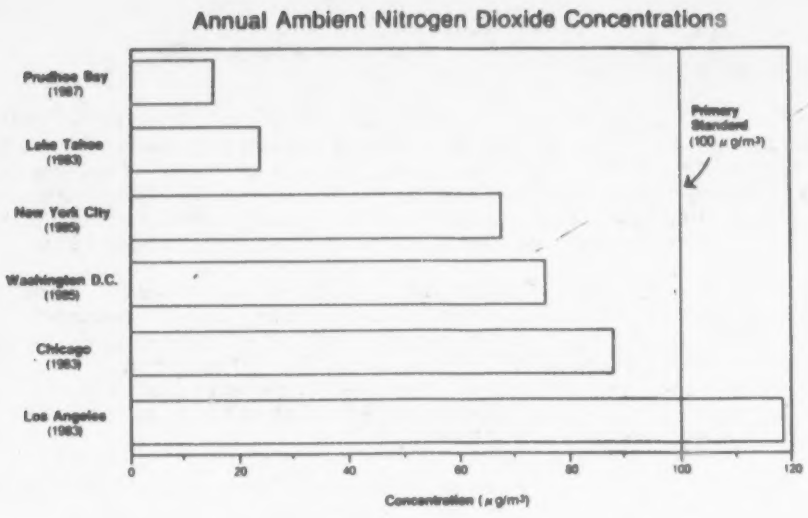
* constructing primary and secondary containment facilities around oil storage areas and other potential sources of pollution; and

* building above or below ground sections for pipelines to allow passage by caribou and other mammals.

Even before exploration and production begins, there will be extensive surveys made of wildlife, vegetation, archaeological sites and Native populations. These surveys are important in avoiding nesting sites of threatened or endangered species, in understanding migration patterns of mammals, fish and water-fowl and in preserving cultural artifacts of earlier generations of Native Alaskans.

# # #

1057C


Annual Ambient Nitrogen Dioxide Concentrations
Prudhoe Bay (1987)
Lake Tahoe (1983)
New York City (1985)
Washington D.C. (1985)
Chicago (1983)
Los Angeles (1983)
Primary Standard (100 μ g/m³)
0
20
40
60
80
100
120
Concentration (μ g/m³)

TECHNOLOGICAL ADVANCES IN NORTH SLOPE DRILLING OPERATIONS

Oil was discovered at Prudhoe Bay on Alaska's North Slope in 1968. The first oil was produced from the Prudhoe Bay field in 1977. Since then, oil has been flowing 800 miles through the Trans-Alaska Pipeline to Valdez. At this time, the Prudhoe Bay, Kuparuk, Lisburne and Endicott oil fields account for 25 percent of domestic oil production.

Over the years, important strides have been made in drilling and production technology that have reduced the amount of land needed for oil field facilities. This evolution in technology minimizes the "footprint" of oil activities and is important as we look to the future and consider development on the Coastal Plain of Alaska's Arctic National Wildlife Refuge (ANWR).

The oil fields on Alaska's North Slope stand as a model of careful development and as an example of evolving arctic technology. Because of these technological advances, the "footprint" of future development in the arctic will be even smaller than in the Prudhoe Bay region.

I. Drilling and Waste Handling Technology

Wells and facilities in the Arctic are placed on gravel pads which insulate the permafrost from thawing. The size of new well pads will be dramatically reduced as a result of improved drilling technology. For example, through the use of directional drill, many wells can be drilled at high angles from a single pad.

Hundreds of wells reaching out to all corners of the oil reservoir can be drilled from just a small number of pads. With experience, drilling technology continues to be refined and wells are drilled at ever greater angles. As a result, the number of wells that can be drilled from a single pad continues to increase.

Other major advances in technology include new drilling rigs which decrease the distance between wells on the surface. The space required for drilling operations is now one-third to one-half what it was a decade ago.

When Prudhoe Bay was first developed, well spacings of 120 feet or more were common. When the neighboring Kuparuk field was built, wells were initially drilled 60 feet apart. Now, with directional drilling, high angle wells, and newly designed rigs, wells can be drilled 25 feet apart. In special cases, wells have been drilled as little as 10 feet apart.

Previously, drill pads included reserve pits large enough to hold drilling muds, cuttings, and fluids from all the wells drilled on that pad. Alternative methods for handling fluids have been implemented. Reserve pits are now designed to contain only the solid cuttings removed from the well. Fluids are either placed back in the well from which they are produced, or collected and placed in another well. Advances in drilling and waste handling technology have reduced the footprint of a well pad by more than one-half.

II. Production Technology

As with drilling technology, a decade of experience has led to the development of new production equipment and the refinement of facility design. Production facilities separate the oil from the natural gas and water. Recently, efforts to redesign the production facilities at Prudhoe Bay showed the same facilities could be rebuild today using approximately one-half the surface space.

III. Oil Field Support Services

On the North Slope, many contractors provide equipment and special support services to the oil companies operating the fields. At Prudhoe Bay, the State of Alaska leases the land to these businesses in an area known as Deadhorse. The facilities at Deadhorse cover about 1,050 acres.

A new satellite service center in the Kuparuk oil field occupies only 55 acres. The Kuparuk Industrial Center (KIC) has consolidated many of the support service companies at a single facility which minimizes the duplication of common facilities required by contractors. In ANWR, operators will maintain control and restrict the footprint as was done at the Kuparuk Industrial Center.

IV. ANWR Coastal Plain

The Coastal Plain of ANWR is covered with snow nearly three quarters of the year. During the brief arctic summer, the tundra comes alive with vegetation and wildlife. The advances in technology ensure that all facilities are designed to minimize surface disturbance and to protect the environment. Visual impact of oil development on the ANWR Coastal Plain will be extremely small.

The area required for well pads, production facilities and service centers will be dramatically less than for the Prudhoe Bay oil field. The surface area will be reduced by at least 50 percent by drilling more wells from smaller pads, consolidating support service contractors, and using the latest production equipment.

VI. Summary

During the last 30 years, the oil industry has been exploring and operating on Alaska's North Slope. In that time, the industry has conducted responsible, environmentally sound operations -- from oil exploration to field development and production. Knowledge gained from past and existing operations and activities has been incorporated into the planning of future projects.

Numerous studies have enhanced our understanding of the Arctic, and show no evidence of significant impacts. The industry is regulated and committed to continued research and monitoring of its activities in the Arctic.

Advances in technology go hand-in-hand with operating experience. This evolution of arctic oil field technology has ensured that alteration of the land is minimal and that disturbances to wildlife are avoided. Therefore, oil development in the Coastal Plain of the Arctic National Wildlife Refuge has the advantage of three decades of technological advances in the art of oil field development.

# # #

1055C

MINIMIZING THE IMPACT OF DEVELOPMENT ON WILDLIFE, WATER AND THE ENVIRONMENT

An important debate is now going on over whether the Coastal Plain of Alaska's Arctic National Wildlife Refuge (ANWR) should be opened to oil and gas development. Some groups opposed to such development are claiming that environmental harm will result, in much the same way as did opponents to construction of the Trans-Alaska Pipeline.

Now that the pipeline and the Prudhoe Bay oilfield have been operating for over 10 years, it is clear there has been no widespread environmental impact. During this time, technology has evolved, and the industry has taken innovative approaches to preventing such impacts.

In pointing to the effects of development at the Prudhoe Bay oilfield, some claim that wildlife populations have diminished, that air pollution is damaging vegetation, and that oil spills and production wastes are left to contaminate the tundra. They also assert that with development in ANWR, the wilderness quality of the entire arctic Coastal Plain will be lost and that resources such as gravel and water will be depleted.

These assertions simply do not stand up to objective scrutiny. If these claims were accurate, Prudhoe Bay, Kuparuk, and other North Slope oilfields would be biological wastelands. This simply is not the case. When the evidence is examined, it becomes clear that the underlying assumption of critics of ANWR development is an aesthetic ideal -- the belief that nature without man's presence is somehow better.

In the end, the most compelling rebuttal to such anti-development claims comes from the fish and wildlife populations that continue to feed, reproduce, and rear their young throughout developed portions of the North Slope. Research has provided no evidence that oilfield activities have produced any measurable change in the population size of any fish or wildlife species using the North Slope. The only changes have been small and localized. There is no proof that the ability of habitat to support fish or wildlife species in the future has been reduced by the very small area of tundra occupied by all North Slope oilfield activities. Less than 2 percent of the land in these oilfields has been affected.

I. Arctic Drilling

The Coastal Plain for the most part is characterized by flat tundra terrain. Underlying the tundra are varying thicknesses of permafrost, ranging from a few feet to several thousand feet, depending on the location. The permafrost is a mixture of sands, soils, gravel and ice which remains permanently frozen.

A major concern has been potential impacts to both the tundra and the underlying permafrost. Because of the short growing season, any damage to the tundra can take years to rejuvenate. In addition, if heat is transmitted through the tundra to the permafrost, it can result in melting and settling of sands and soils, which in turn causes swamping and ponding of waters at the surface, further disturbing the tundra.

One of the key improvements in development technology has been the reduction in the land needed to support a drilling operation. The operators on the North Slope have advanced the state-of-the-art drilling technology through such techniques as directional drilling. Dozens of wells can be drilled from the same pad with as little as 25 feet separating the wells. In special cases, wells have been drilled even closer together. From the centralized drilling pads, wells fan out at angles from the surface location to reach remote parts of the underground oil reservoir.

Advances have also been made in the handling of oilfield wastes. For example, most of the water produced along with the oil is now injected back into the oil reservoir to increase the pressure and allow for the recovery of more oil. This salty water is thus put to productive use rather than disposed of as a waste. In addition, wastes such as used oils, diesel, and some solvents are now recycled. Improvements have also been made in the design of safety flares at oil processing facilities to reduce the number of black smoke emission incidents.

New designs are being used for reserve pits -- the containment pits built into the gravel drilling pads to hold the muds and cuttings that are the by-products of the drilling process. In the past, reserve pits were made simply of frozen gravel. Advances in pit design, including the use of synthetic embankment liners and thawed and compacted gravel, now make it possible to minimize the seepage of pit fluids through the walls. Most important, improved ways of controlling the accumulation and disposal of fluids in the pits are now being used. These accumulated fluids are injected underground.

Many of the reported problems at Prudhoe Bay have resulted from poor operating practices by oilfield service contractors based at Deadhorse. Some of these contractors have abandoned wastes at their pads, which are on land they leased from the State of Alaska, and the operators of the field are voluntarily stepping in to clean up these problems. At the recently developed Kuparuk field to the west, service contractors have been placed under more direct control. Contractor facilities are centralized in a location called the Kuparuk Industrial Center. Similar practices will be followed in ANWR to ensure that the operators have control over contractor facilities and have the legal responsibility to maintain environmental operating standards.

Since the Prudhoe field began operation, methods have evolved to accommodate the passage of wildlife by installing crossing ramps and elevating pipelines. In the past 10 years, there has been no discernible decline in the overall use of the area by wildlife. Caribou from the Central Arctic herd continue to move through the oilfield during calving and insect relief periods. The Prudhoe Bay oilfield has been in existence for long enough to represent the long-term effects from oil development. The evidence supports the claim that wildlife and development goals are mutually achievable.

II. ANWR Coastal Wilderness

It is important to understand that Congress is not considering opening all of the ANWR Coastal Plain to oil and gas development. The area under consideration consists of 1.5 million acres of the 19 million acres in ANWR. This "1002 area" is the part of ANWR's Coastal Plain that, because of its petroleum potential, was set aside for special study in Section 1002 of the Alaska National Interest Lands Conservation Act of 1980. This study, recently completed by the U.S. Fish and Wildlife Service, concluded that the 1002 area should be opened to development under appropriate environmental controls and regulation.

Some opponents to development contend that with opening of the 1002 area, the entire Coastal Plain would lose its wilderness character. However, the 1002 area does not include all of the ANWR Coastal Plain. The remaining 30-mile stretch of Coastal Plain between the 1002 area and the Canadian Border contains 450,000 acres of legally designated wilderness.

This large tract of coastal wilderness outside the 1002 area includes a complete continuum of terrain and habitat types similar to those within the 1002 area, including five major river systems. This coastal wilderness is part of the refuge's 8 million acres legally protected as Wilderness, accounting for about 42 percent of ANWR's total area. The ANWR wilderness, together with the rest of the refuge that would not be open to oil development, is nearly the size of the State of South Carolina.

A second misconception is that petroleum leasing and development would remove large areas of habitat from the 1002 area. More than ninety-nine percent of the 1002 area will remain untouched even under full leasing.

Contrary to the impression being attempted by opponents of development, the 1002 area is not unique. The great majority of Alaska's Arctic Coastal Plain has similar land-forms, scenic resources, and habitats, including the ANWR coastal wilderness to the east of the 1002 area. The true uniqueness of the 1002 area lies in its oil potential, not its wilderness quality.

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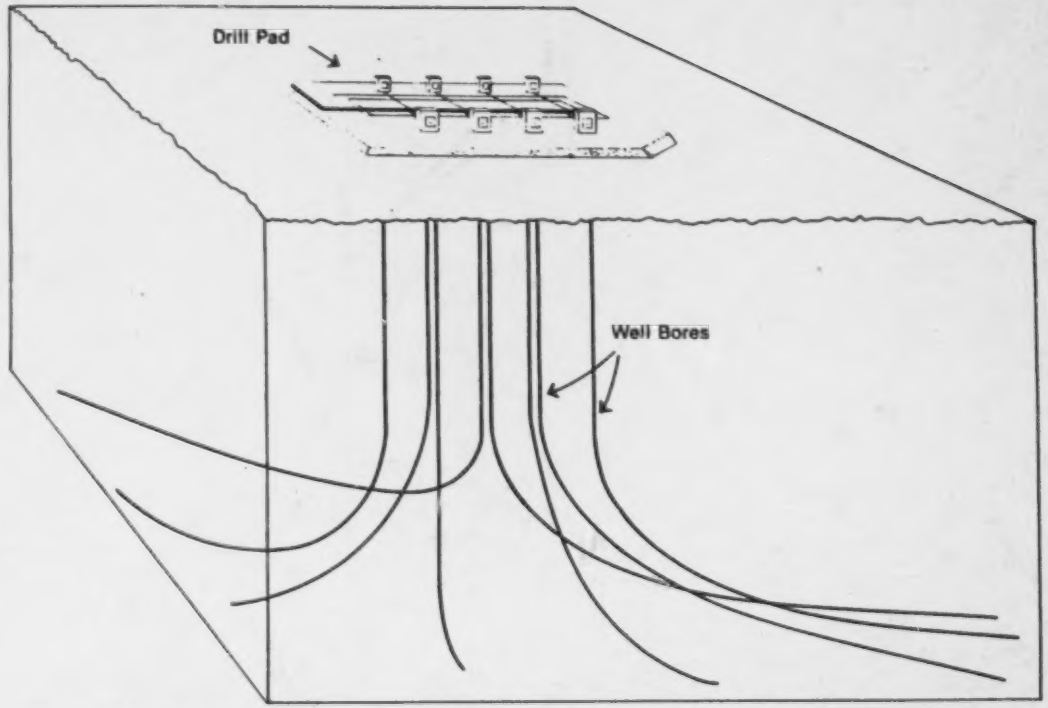
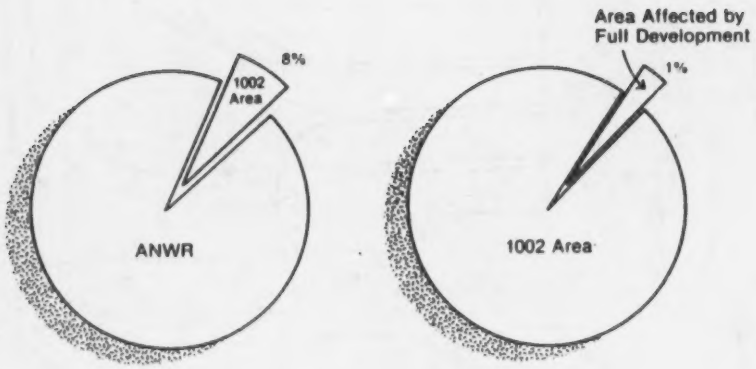


The evolution of directional drilling technology has helped to minimize the land needed for drilling operations. Wells are drilled at angles away from the pad to reach various locations in the oil reservoir.


8%
1002
Area
ANWR
Area Affected by
Full Development
1%
1002 Area

COMPATIBILITY OF OIL AND GAS OPERATIONS IN AND ADJACENT TO WILDLIFE REFUGES AND CONSERVATION UNITS

There have been many instances of compatibility of oil and gas operations in wildlife refuges and conservation units in Alaska and in the Lower 48 states. The National Institute of Urban Wildlife prepared a report for the American Petroleum Institute entitled "Environmental Conservation and the Petroleum Industry," which documents a variety of examples which show that environmental conservation and oil and gas operations are compatible.

Here are several examples of where oil and gas exploration has been conducted successfully in other units.

* Coastal Marsh Land in Southern Louisiana - Major concern was erosion caused by the uncontrolled ebb and flow of the tides through the canals. The Louisiana Land and Exploration Company developed water control structures in conjunction with its oil and gas operations to retard the erosion, and those areas protected by the structures have become nursery grounds for fish and other marine life, homes for fur bearing animals, wintering grounds for waterfowl and sanctuaries for a variety of birds.

* Pigeon River County State Forest, Michigan - Major concern was the impact of oil and gas development on the elk population. After extensive studies were conducted, operations were designed to lessen impact on the elk. Current studies since operations have been conducted show no adverse effect on the elk population.

* Rockefeller State Wildlife and Game Preserve, Louisianna - The American alligator, once thought to be near extinction, has come back. Revenues from the oil and gas leases contribute to a trust for research and wildlife conservation and management of this reserve.

* Big Cypress Swamp in Southern Florida. The Florida Department of National Resources recently conducted an investigation of the effects of oil exploration and production on the swamp and concluded that 30 years of petroleum operations have had no significant adverse effects on this wetland area.

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* Aransas National Wildlife Refuge, Texas. The whooping crane winters in the Aransas National Wildlife Refuge located on the Gulf Coast about 20 miles from Corpus Christi. The refuge is protected by the San Jose and Atagorda barrier islands and lies adjacent to the inland waterway.

* Avery Island, Louisiana. Privately owned, the 2,500-acre Avery Island lies atop a salt dome amid 5,000 acres of marsh and cypress swampland. The island's summertime snowy egret population is estimated at 100,000, although many other birds -- as well as animals -- live there. The first producing well was drilled on the island in 1942 and, since then, millions of barrels of oil have been safely extracted from the field below. Revenues from the petroleum have helped support wildlife management practices on the island.

* Corkscrew Swamp Sanctuary, Florida. In 1980, the National Audubon Society leased acreage in the northeast corner of the Corkscrew Swamp Sanctuary near Naples for the drilling of an exploratory well. The leasing agreement included an extensive list of environmental safeguards for wildlife, wildlife habitat and the complex conditions of the area. The lessee would pay for any inadvertent damage caused to the sanctuary, and all waste would be removed from the side.

  This cooperative effort benefits both the conservation community and the oil company. The conservation community -- in this case the Audubon Society -- receives substantial revenues to further its program, and the company receives the oil and natural gas produced to help meet America's energy needs.

* Delta National Wildlife Refuge, Louisiana. The entire Romere Pass production field, including the terminal station, is located in the Delta National Wildlife Refuge. The refuge was established in 1935, primarily as feeding and nesting habitat for large wintering waterfowl populations, including up to 35,000 for many other water and shore birds, as well as for white-tailed deer and other animals. Such coastal marshes in Louisiana have been the site of extensive natural gas and oil exploration and development, yet the region teems with fish and wildlife.

* Kenai National Wildlife Refuge, Alaska. Formerly called the Kenai National Moose Range, this 1.97-million acre refuge was established in 1941 on the Kenai Peninsula south of Anchorage. Sixteen years later, when the moose population was estimated to be about 3,000, oil was discovered; the moose population there now exceeds 4,000.

* Paul J. Rainey Sanctuary, Louisiana. Petroleum operations have taken place in the National Audubon Society's Paul J. Rainey Sanctuary for more than a quarter of a century. These operations have been carefully tailored to protect the habitat of the 26,161-acre area, which is the wintering grounds for lesser snow geese. Thousands of coots and various species of rails use the marsh, as do egrets, roseate spoonbills, herons and songbirds.

Many species of animals are compatible with petroleum operations, both in the lower-48 states and in Alaska. On Alaska's North Slope, for example, caribou move freely about the oilfields around Prudhoe Bay, and waterfowl return each year to the marshlands and tundra near the coast. Experience there demonstrates that those operations are environmentally compatible. And the care taken to protect the environment there -- including the wildlife and its habitat -- will not be repeated within the ANWR coastal plain, if leasing is permitted there.

* Texas Coastal Plain. These areas, the site of numerous wellheads, drilling sites, and pipelines, are also the mating and breeding grounds for the endangered Attwater prairie chicken. Studies have shown that prairie chickens behave no differently on artificially maintained grounds near oil operations than on their natural mating and breeding grounds.

Many petroleum companies operated under their own strict environmental standards prior to passage of the National Environmental Policy Act of 1969. We believe the development of the Prudhoe Bay oil and gas field shows we can safely operate in ANWR.

The plans of operation presented to the Federal and state regulatory agencies for approval prior to drilling satisfied the following concerns:

a. Archaeological and cultural resources.
b. Access roads to location.
c. Construction of drilling pad.
d. Air strip construction.
e. Type of drilling rig, equipment design and layout.
f. Down hole operations, (drilling fluids, coring and cementing, and testing).
g. Water supply.
h. Liquid waste, sewage, solid waste.
i. Contingency plans in case of spills, leaks, or other accidents.

j. Wildlife protection.
k. Air pollution.

The petroleum industry has demonstrated that new areas of exploration and sensitive areas such as the ANWR can be explored and developed through joint operation during the exploration phase and through a cooperative unit plan with one operator during the development phase; thereby creating an even lesser impact on the environment.

# # #

1052C

ENERGY SECURITY

a. Current Status of Domestic Oil Reserves
b. Effects of Conservation Only
c. U.S. Oil Dependence on Middle East/Growing Consumption
d. National Energy Policy
e. ANWR Oil Potential

PETROLEUM POTENTIAL OF THE ANWR COASTAL PLAIN: ONLY A FEW MONTHS' SUPPLY OF OIL?

Legislation to open Alaska's Arctic National Wildlife Refuge (ANWR) Coastal Plain to petroleum development will again be a major issue before Congress during 1989. Committees in both the Senate and the House approved ANWR Coastal Plain bills in 1988, but the Congress adjourned without taking final action on the legislation.

In its April 1987 report to Congress, the U.S. Department of the Interior urged that the ANWR Coastal Plain which occupies about 8 percent of that 19-million acre refuge, be opened to petroleum exploration and development. The department stated that up to 9.2 billion barrels of recoverable oil might be found there and that the mean amount of expected oil would be about 3.2 billion barrels. That oil -- if discovered and recovered -- could be important to the nation's energy future.

Nevertheless, opponents to opening the area allege that, in light of U.S. oil needs, development of the ANWR Coastal Plain would be likely to yield at most only a few months' supply of oil. By this argument, no field has ever been or ever will be worth developing. Yet, the history of petroleum production in the United States clearly shows that all fields -- small and large -- are important to the nation's energy security.

Most of the older U.S. oil fields, large and small, are approaching or have passed their peak production and major discoveries are needed to maintain an adequate level of domestic oil production. However, the U.S. economy is so large and U.S. energy needs so great that even a major find can be measured only in weeks or months of total consumption, not in years.

The United States is currently importing more than 40 percent of the oil it uses, and every domestic barrel produced today represents its energy requirements. Moreover, the need to find and develop the potentially vast oil resources beneath the ANWR Coastal Plain will grow increasingly important as production from Alaskan North Slope declines. Those fields now account for one-fourth of total U.S. oil production.

Status of Domestic Oil Reserves

Opponents of oil exploration and development on the Coastal Plain fail to recognize (1) that U.S. oil reserves are the accumulation of thousands of individual fields, (2) that daily U.S. oil output is the sum of the contribution of those thousands of fields, and (3) that many of the fields have been contributing to the nation's annual production over decades, not just for a few days or months:

* Of the more than 27,000 oil fields in the United States, nearly 80 percent have reserves of less than 1 million barrels (far less than one day's consumption). Yet, together, these fields produced nearly 3 billion barrels of oil in 1988.

* The ANWR Coastal Plain has the potential for producing 150,000 to 600,000 additional barrels per day for 20 to 30 years. Production of 600,000 barrels per day would put this single area of the United States among the top 20 countries of the world in terms of crude oil production.

* Of the more than 620,000 producing oil wells in the United States at the start of 1988, some 460,000 -- more than 74 percent -- were "stripper wells" (wells that produce 10 barrels of oil or less a day). Taken together, these small-volume wells accounted for about 14 percent of the domestic oil produced in 1987. Yet each one, taken alone, could supply only a tiny fraction of even one day's U.S. consumption.

* Oil discoveries, large and small, contribute to domestic energy supplies over decades, not days or months. For example, wells in the Gulf of Mexico have been producing from 9 to 13 percent of domestic crude oil over a 30-year period.

The Importance of a Major Oil Discovery

The Interior Department's 3.2 billion-barrel mean estimate of the ANWR Coastal Plain's recoverable oil would be a significant addition to U.S. oil supplies and would be the third largest oil find in U.S. history -- exceeded only by the Prudhoe Bay and East Texas fields.

* When discovered, the original Prudhoe Bay field held an estimated 9.6 billion barrels of recoverable oil, of which some 6 billion barrels of oil has been produced. Even that 1968 discovery represents less that a two-year supply of total U.S. oil consumption. Yet, that field and other North Slope fields -- with combined recoverable reserves now estimated at over 12 billion barrels of oil -- have been producing between 15 and 25 percent of all of the oil produced in the United States since 1977 and are expected to continue to make a substantial contribution to U.S. oil supplies into the next century.

* The East Texas field was discovered in 1930 and has produced some 5 billion barrels of oil.

If the department's high estimate of 9.2 billion barrels were to be realized, the ANWR Coastal Plain could yield almost as much oil as the Prudhoe Bay field and would increase domestic crude oil reserves by about one-third.

Another perspective on the potentially vast resources beneath the ANWR Coastal Plain is that the department's mean estimate of 3.2 billion barrels is roughly half of all the oil that has been produced from the more than 3,000 wells in the federal portion of the Gulf of Mexico since federal leasing began there in 1954.

Apart from the record oil discovery at Prudhoe Bay, additions to domestic reserves in recent decades have come largely from the cumulative effect of many discoveries, few of which could provide more than a few days or a few weeks of total U.S. production. Only 13 fields with over 1 billion barrels of recoverable oil have ever been discovered in this country. (One billion barrels is enough to supply about two months' consumption in the United States.) Most of those huge fields came into production before World War II, and some were discovered in the 19th century. For example, the Yates (Texas) field, which was discovered in 1926 and has produced more than 1 billion barrels of oil, is still active and produced almost 45 million barrels of oil in 1986. Also, the Kern River (California) field, which was discovered in 1899, produced nearly 48 million barrels of oil in 1986.

Even small fields, however, are often productive for a long time. The Jay (Florida) field, for example, was discovered 18 years ago. It has produced more than 350 million barrels of oil (far less than one month's U.S.

consumption) and is still producing at an annual rate of about 6 million barrels (less than a half-day's consumption). And in a number of states, such as Pennsylvania where the nation's first successful oil well was drilled more than 129 years ago, there have been few discoveries in recent years. Yet fields in Pennsylvania -- with some 1.4 billion barrels of oil reserves -- contributed some 4.8 million barrels to U.S. production in 1986.

Conclusion

U.S. oil production is the sum of oil from all fields -- large and small. Each field makes its contribution to our domestic energy supply. And each contributes to lessening the quantity of oil this nation needs to import to maintain its economy and security.

It is unrealistic to attempt to measure each field's potential production in terms of days or months or even years and to base leasing decisions on that measurement. Rather, such decisions should be based on a policy of offering the opportunity to lease areas to firms that are willing to risk their capital to determine if economically producible oil exists that could contribute to future domestic energy supplies. That is the principle that should be followed for the ANWR Coastal Plain.

The United States is facing the prospect of declining production from existing fields and sharply increased future oil imports. Opening the ANWR Coastal Plain to petroleum exploration and development -- under strict environmental guidelines -- is necessary to ensure future domestic petroleum supplies, and to realize the economic benefits of the resources that are thought to be there.

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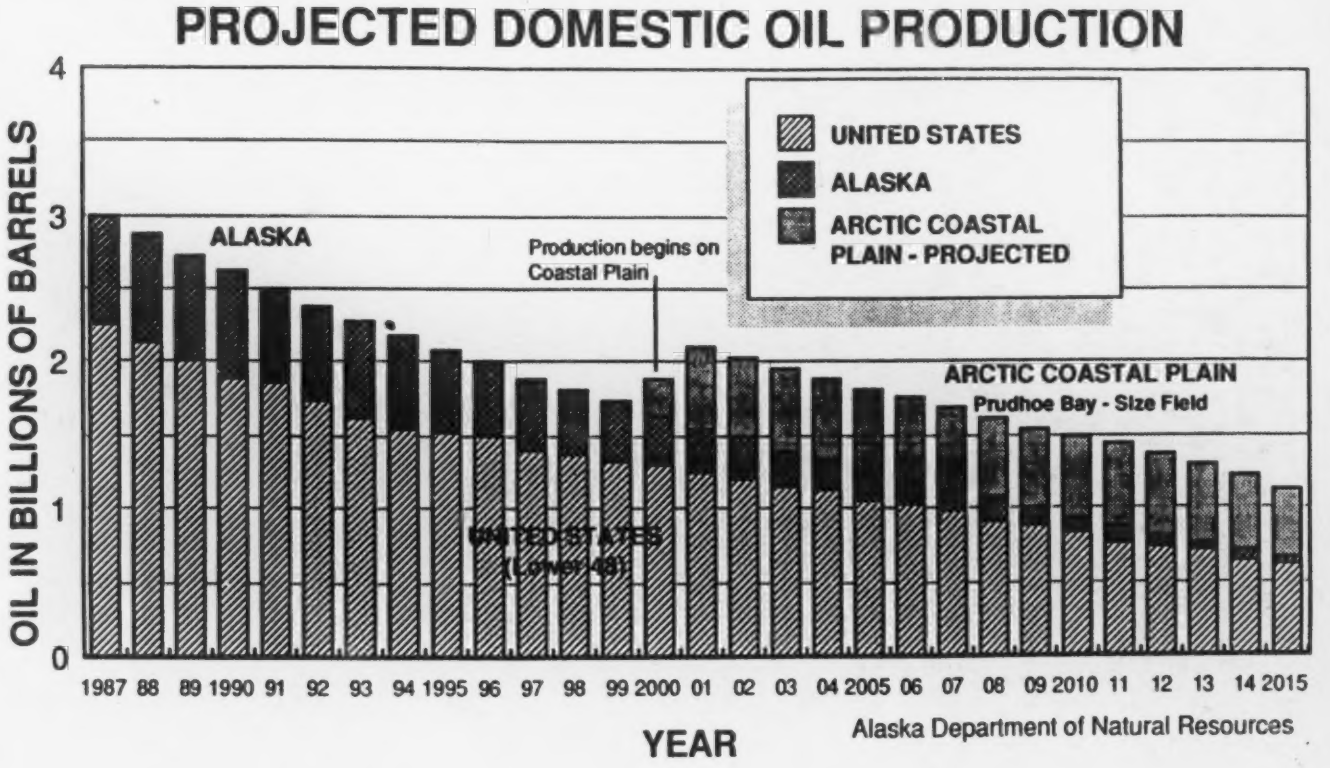
PROJECTED DOMESTIC OIL PRODUCTION
OIL IN BILLIONS OF BARRELS
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3
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UNITED STATES
ALASKA
ARCTIC COASTAL PLAIN - PROJECTED
ALASKA
Production begins on Coastal Plain
ARCTIC COASTAL PLAIN
Prudhoe Bay - Size Field
UNITED STATES (Lower 48)
1987 88 89 1990 91 92 93 94 1995 96 97 98 99 2000 01 02 03 04 2005 06 07 08 09 2010 11 12 13 14 2015
YEAR
Alaska Department of Natural Resources

Footnote: The figures for total production are based on the National Petroleum Council's Committee on U.S. Oil and Gas Outlook 1986. The projected trend assumes oil prices range from $12 per barrel (1986) to $21 per barrel (2000).

CONSERVATION ALONE CANNOT SOLVE THE NATION'S DEPENDENCE ON FOREIGN OIL

Our dependance on foreign oil demands that we search for new domestic supplies. Opponents of oil exploration and development on the Coastal Plain of Alaska's Arctic National Wildlife Refuge (ANWR) claim that energy conservation alone can cure the nation's growing dependence on foreign oil. Preservationists assert that the government can stave off a future energy crisis, either by subsidizing the immediate replacement of every "gas-guzzling" automobile or by paying to weatherize every home and building. They state that either effort will save enough oil to cut petroleum imports to zero, and we won't have to search the nation's frontiers for additional oil reserves.

Oil and natural gas account for about 65 percent of U.S. energy consumption; oil alone over 40 percent. The U.S. transportation sector is about 95 percent dependant on oil-based fuel. Currently the most economic alternative to pure gasoline as a motor fuel is gasoline blended with alcohol; methanol from natural gas or coal, and ethanol made primarily from corn. Alcohols and other materials, with current technology, are far from being economically competitive with oil-based fuels. Technology and economic barriers make it unlikely that alternative fuels will contribute significantly to our needs in the near future.

If conservation alone sounds too good to be true, that's because it is. We will need both energy conservation and new production to keep our national imports from climbing faster in the future. The potentially huge reserves beneath the remote ANWR Coastal Plain could eventually yield billions of barrels of oil - if we begin now to develop them in a timely and environmentally sound manner.

But the effort to unlock ANWR's energy is being slowed by irresponsible claims that a single mandate such as weatherization or replacing inefficient cars will save enough oil to eliminate imports, making it unnecessary to drill on the Coastal Plain. The facts simply don't support such claims. Oil imports now average more that 6.5 million barrels a day, while automobile and truck fuel consumption alone totals 7.2 million barrels a day. Saving enough oil to eliminate imports would require more than an 85 percent reduction in fuel used by all cars and trucks in America. Even if every one of the nearly 120 million cars in the United States could be replaced immediately with a 40 mile-per-hour miles per gallon auto, total fuel savings would be less than half of U.S. imports.

The costs for such a plan would be staggering. If government regulation resulted in the replacement of even half of our autos with 40-mile per gallon cars, it would cost at least $450 billion, which is three times the current annual federal budget deficit. Even after subtracting oil savings of about $100 billion, the proposal would still cost at least $350 billion.

If conservation measures are practical and don't cost more than they save, consumers will adopt them voluntarily. The same test should apply to proposals for energy development. Using this measurement, oil from ANWR is a bargain. It could contribute more than a million barrels a day to the nation's oil supplies. It will also provide income to the federal treasury in the form of royalties, rent and tax revenues.

Nuclear power and the use of coal are limited in their contribution to our energy needs because of the costs, safety and environmental concerns. Technology, economic costs and public acceptance will continue to be barriers to significant increased use of these resources.

Solar power has made only a limited contribution to the overall energy picture and appears to need significant technological breakthroughs to provide a feasible, cost effective energy source.

Shale oil and tar sands have been considered as sources of energy. Oil companies and the federal government have invested significant amounts of money in studies and technology to test the development of these resources. These alternatives don't appear to be economically competitive alternatives in the near future.

The development of alternative energy sources should be part of the nation's energy strategy. Over the long term, many various energy sources will ultimately be developed as they become economically and environmentally feasible. Today and in the foreseeable future, oil will play a dominant role in our energy needs and security.

The only real cure for oil import dependence is to do everything possible today to ensure that America has as much domestic energy resources as possible for the future. Neither conservation nor production can do the whole job.

# # #

1063C

U.S. OIL DEPENDENCE

With the Bush Administration and a new Congress taking office, it is time for a dramatic rethinking of America's energy posture.

Energy concerns have largely slipped from public view during the 1980's. The glut of oil on world markets and falling energy prices have left most Americans complacent about energy supply. But the current glut masks both long- and short-term energy problems for the nation.

The truth is that the state of the nation's energy health today is perceived as "good" only because enough inexpensive foreign oil is available. Our conditions could turn to "poor" or "critical" if that supply were disrupted -- depending on the degree of vulnerability of alternative supplies.

What foreign oil-producing states do will make a big difference to the situation in this country. However, what the U.S. government does also will make a big difference. The U.S. government can take positive actions to improve the country's future economic and energy posture or negative ones to worsen it. A major concern of energy analysts and economists is that Washington, largely insensitive in today's environment to world and domestic energy trends, will both choose the negative options and avoid the positive ones.

The impact of government decisions on energy could be more than 2 million barrels a day of increased domestic oil supply by the end of the 1990's. Two million barrels a day represents about one-eighth of current U.S. oil use -- and is about three times the amount of the shortfall in the 1970s crises.

Unfortunately, there has not been and will not be any single all-encompassing "Yes or No" government issue on energy security around which to rally consumers and influence decision-makers, but rather a series of issues in a wide variety of fields such as taxation, environment and public lands.

However, the situation for both the industry and the country's economy must be viewed in the context of worldwide trends in petroleum markets and the disturbing energy scenarios to which they might lead. The facts are these:

* Domestic oil production is down and continues to fall.

* Domestic consumption is at a peak for this decade and continues to rise, increasing at an annual rate of about 2 percent.

* With production down more than 1 million barrels a day since 1986 and consumption up more than 1 million barrels a day, imports have increased by 2 million barrels a day.

* Imported oil makes up 44 percent of the oil that the United States uses -- up dramatically from 31 percent only three years ago, the highest in eight years and nearing the record 48 percent of 1977.

* Most of the future increases in oil imports by the United States and our allies must come from the Middle East. Imports from the Persian Gulf area tripled in 1986 and continued to rise in 1987 and 1988.

* Active drilling rigs, the key indicator of U.S. petroleum development activity, were down to 921 in mid 1988 -- compared with 4,000 in 1981 and 1,200 in 1973.*

* Oil discoveries and production do not fall in direct proportion to the decline in active drilling rigs. With lower prices, the least promising projects are eliminated first, while the most promising go forward.

Two Likely OPEC Scenarios

World oil demand is rising, while there is little or no growth in non-OPEC production of oil and production may even decline in the future. Additional demand for oil is being met largely by OPEC countries, particularly by the large producing states in the Persian Gulf.

If these demand and production trends continue, a future price shock could occur under either of two possible scenarios: Under one scenario, world oil demand would continue to increase, while OPEC maintained its current production capacity or reduced it -- leading to tight

markets in just a few years. Under a second scenario, OPEC would increase its production capacity, enlarging its ability to meet or exceed demand -- keeping prices low for a longer period but increasing the potential damage from a price crunch. Under either scenario, OPEC's relative power to control world oil prices could be strengthened. Here are the reasons.

The Dimensions of Energy Policy

Decisions made by the Bush Administration and Congress will profoundly affect the nation's energy/economic security in the 1990s and early 2000s. The objective should be to ensure an adequate and secure supply of energy at reasonable prices while reducing vulnerability to a future oil crisis.

Energy policy should be consistent with, and supportive of, other important national goals including: healthy economic growth, environmental protection, solid employment, reduction of the budget and trade deficits, and a strong foreign policy.

The policy must take into consideration the possible behavior patterns of OPEC and how that behavior might be influenced. A "national energy policy" does not mean further government involvement in energy markets. Rather, it means choices that encourage a healthier U.S. petroleum industry involving companies of all sizes, working to discover, produce, process and distribute petroleum supplies to U.S. consumers.

Background Facts on U.S. Oil Dependence

* Our nation now imports about 44 percent of its petroleum, which is more than on the eve of the Arab oil embargo.

* One-fourth of our domestic supply comes from Alaska's North Slope. Existing North Slope production is showing signs of declining. If U.S. dependence on oil imports continues to increase, as is projected, it will have serious national economic and security consequenses.

* When oil imports increase so does the U.S. trade deficit. The U.S. currently is spending about $40 billion a year on oil imports. According to the U.S. Energy Information Administration, about 55 percent of the U.S. oil supply in 2000 will come from foreign sources at an annual cost of more than $110 billion.

* Rising U.S. petroleum imports as well as increased oil imports by our allies would increase the U.S. strategic interest in the Middle East, which holds about 63 percent of the free world's oil reserves.

* The economic benefits from development of a major oil field in Alaska would be felt nationwide. Every state in the nation has benefited financially from Alaska North Slope oil development. More than $36 billion have been invested to date, with over $10 billion spent on goods and services from around the country between 1980 and 1986. As an example, over $541 million was spent in New York State alone.

* The U.S. Department of Energy estimates that production of oil from ANWR could substantially improve the U.S. balance of trade since fewer dollars will leave the U.S. to purchase foreign oil if major reserves are found in the Coastal Plain.

* Net national economic benefits from ANWR production could reach $325 billion in the high-case estimate of 9.2 billion barrels of recoverable oil.

* Lease-sale receipts from bonus bids are projected by the Department of Interior to range between $2 and $4 billion, even if no oil is discovered; with a commercial discovery, a royalty of 12.5 percent will generate very substantial revenues from production.

* The lead time for Arctic oil production is between 10 and 15 years. If the process is begun now, Coastal Plain production could come on line about the year 2000.

# # #

1046C

NATIONAL ENERGY POLICY

Opponents of development want Congress to withhold the decision to allow oil exploration and development on the Coastal Plain of Alaska's Arctic National Wildlife Refuge (ANWR) while they debate whether ANWR oil resources are essential to the long-term energy needs and security of America.

The nation needs to continue to pursue broad policies on energy diversification, conservation and efficiency. However, further steps to conserve energy and develop alternate fuels do not change the fact that oil will remain an essential energy source for the U.S. and the world for the foreseeable future.

Domestic oil production continues to decrease, while consumption is on the rise, leading to greater dependence on foreign oil. We are now importing more than 40 percent of the oil consumed in the U.S. That percentage is expected to exceed 50 percent in the 1990s. It is clear that no single energy policy can reduce this trend. Therefore, it is essential that we continue a broad-based approach that includes finding and efficiently using domestic oil resources.

An early decision by Congress to allow leasing and exploration on the Coastal Plain of ANWR is one of the most significant actions that could be taken toward energy independence and security. Prudhoe Bay production will begin a decline in the next year or so and the Coastal Plain of ANWR represents the best possible replacement. Discovery and development of potentially large oil resources on the Coastal Plain would give us the time needed to develop other alternate energy sources.

It is imperative that Congress not delay action to open the Coastal Plain to exploration and development while opponents debate the national energy policy. If the Coastal Plain were leased today, it will be beyond the year 2000 before oil, if any is found, could be contributing to declining domestic production.

1066C

PETROLEUM POTENTIAL IN THE ARCTIC NATIONAL WILDLIFE REFUGE

There is no doubt that the Arctic National Wildlife Refuge (ANWR) could contribute significantly to offsetting a rapidly declining domestic proven reserves. It is estimated that the daily U.S. production from existing fields will decline from the nearly 9 million barrels today to about 5 million barrels by the year 2000. To supply the U.S. demand in the year 2000, we will need an additional 10 million barrels per day from new domestic reserves or become even more dependent on foreign sources. ANWR could go a long way in providing those additional discoveries.

The Interior Department estimates there could be 9.2 billion barrels of recoverable oil under the Coastal Plain. Thomas Marshall, a well-known Alaskan geologist, who conducted a private study for the National Wildlife Federation concluded that the federal estimates of hydrocarbon potential on ANWR are conservative.

USGS investigator Kenneth Bird (1984) estimated potential reserves from one billion barrels of oil up to 22.4 billion barrels, with an average 6.9 billion barrels. He also determined the average field size to be in the supergiant class and contain 900 million barrels of oil. Results of these USGS assessments confirm and quantify what geologists have believed for years -- that the ANWR Coastal Plain has the potential for large hydrocarbon reserves.

The Department of Interior Coastal Plain Resource Assessment estimated in-place resources of between 4.8 and 29.4 billion barrels of oil. Recoverable reserves were estimated to range from between 600 million and 9.2 billion barrels, with a mean recoverable reserve estimate of 3.2 billion barrels.

Finally, these estimates of major potential should be placed in the context of lower 48 oil field discoveries. In recent years, the typical oil field discovered was less than one million barrels. As a prospective petroleum province, ANWR may exceed that of Beaufort Sea, offshore California and the deeper waters of the Gulf of Mexico.

The Importance of a Major Oil Discovery

The Interior Department's 3.2 billion-barrel mean estimate of the ANWR coastal plain's recoverable oil would be a significant addition to U.S. oil supplies and would be the third largest oil find in U.S. history -- exceeded only by the Prudhoe Bay and East Texas fields.

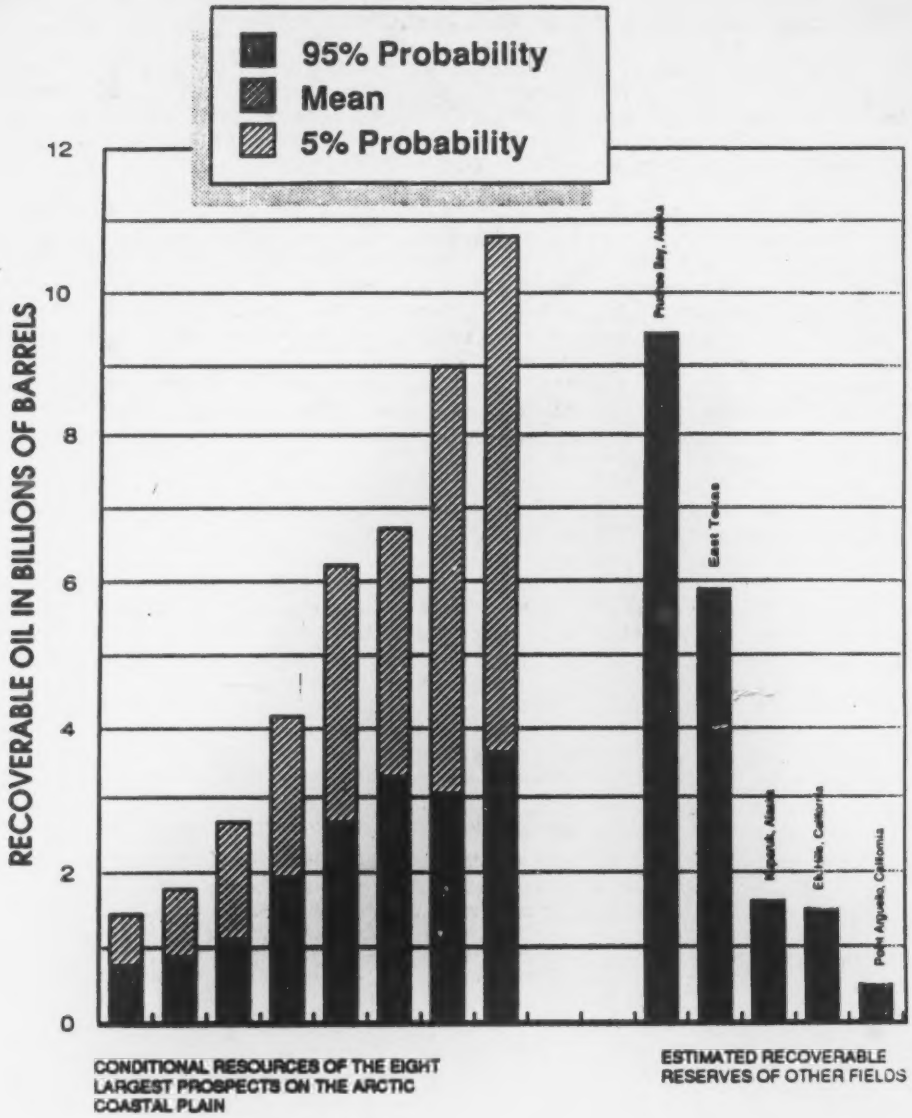
* When discovered, the original Prudhoe Bay field held an estimated 9.6 billion barrels of oil, of which some 6 billion barrels of oil has been produced. Even that 1968 discovery represents less than a two-year supply of total U.S. oil consumption. Yet, that field and other North Slope fields -- with combined recoverable reserves now estimated at over 12 billion barrels of oil -- have been producing between 15 and 25 percent of all of the oil produced in the United States since 1977 and are expected to continue to make a substantial contribution to U.S. oil supplies into the next century.

* The East Texas field was discovered in 1930 and has produced some 5 billion barrels of oil.

If the department's high estimate of 9.2 billion barrels were to be realized, the ANWR Coastal Plain could yield almost as much oil as the Prudhoe Bay field and would increase domestic crude oil reserves by about one-third.

# # #

1056C



Conditional, economically recoverable oil resources on the Arctic Coastal Plain compared with estimated ultimate recoverable reserves of five known producing fields. (From Clough, Patton & Christiansen, 1987, Pg. 57)

LEGISLATION

a. Current Legislation
b. ANWR Legislative Timeline
c. Pertinent Congressional Testimony

CURRENT ANWR LEGISLATION

Legislation addressing the future disposition of the Arctic National Wildlife Refuge (ANWR) Coastal Plain has been introduced in the 101st Congress.

S. 406 (by Senators J. Bennett Johnston and James A. McClure) has been referred to the Senate Energy and Natural Resources Committee. According to Senator Johnston, S. 406 "...provides for the phased competitive leasing of the Coastal Plain; imposes strict environmental standards; requires that exploration, development and production be undertaken in a manner consistent with the interests of the area's subsistence users; and provides that a significant portion of ANWR revenues be available for use in conservation programs including the Land and Water Conservation Fund and wetlands protection, acquisition and restoration." The Senate Energy Committee is expected to act on S. 406 early in the 101st Congress.

H.R. 39 (by Representative Morris K. Udall) and S. 39 (by Senator William V. Roth, Jr.) would designate the ANWR Coastal Plain as part of the National Wilderness System. Wilderness designation is the most restrictive of all public land classifications. Under Wilderness designation, all resource development and most human uses are precluded.

H.R. 49 (by Representative Don Young) would authorize exploration, development and production on the ANWR Coastal Plain and require that the Secretary of the Interior impose regulations to insure the protection of wildlife and environmental values.

On the House side, the principal committees of jurisdiction are the Subcommittee on Water and Power Resources of the Committee on Interior and the Insular Affairs chaired by Representative George Miller and the Subcommittee on Fishers and Wildlife Conservation and the Environment of the Committee on Merchant Marine and Fisheries chaired by Representative Gerry E. Studds.

Another bill, S. 471, which would allow competitive leasing, exploration, development and production has been introduced by Senator Frank Murkowski. Representative Walter Jones, Chairman of the Committee on Merchant Marine and Fisheries also is expected to introduce legislation early in the 101st Congress that would allow leasing of the Coastal Plain.

# # #

1067C

IMPORTANT LEGISLATIVE AND OTHER DATES IN THE HISTORY OF THE ARCTIC NATIONAL WILDLIFE REFUGE (ANWR)

Date	Event
1903	First national wildlife refuge established by President Theodore Roosevelt's executive order
1919	Migratory Bird Treaty signed
	Presence of surface oil seeps on Alaska's North Slope, long known to Natives, described by Leffingwell in U.S. Geological Survey professional paper
1929	Migratory Bird Conservation Act
1944	U.S. Navy drills first of several exploratory wells near Barrow on Naval Petroleum Reserve No. 4 (now the National Petroleum Reserve, Alaska)
January 3, 1939	*Alaska Statehood Act permits state to select certain lands from the federal domain as an economic resource base
December 6, 1960	Arctic National Wildlife Range created
1963	First exploratory well drilled on U.S. North Slope by private industry
December 14, 1964	State of Alaska holds first oil and natural gas lease sale on the North Slope on tracts east of Prudhoe Bay obtained under the Alaska Statehood Act (that state's 13th competitive sale)
July 14, 1965	State of Alaska holds its second North Slope lease sale (its 14th competitive sale)

*

*Brief synopsis of law follows.

1965	First onshore well drilled in Canada's Mackenzie River Delta
March 13, 1968	Participating companies announce first discovery well on state lands at Prudhoe Bay; discovery contains nearly 10 billion barrels of oil and 26 trillion cubic feet of natural gas
September 1969	State holds competitive lease sale 23 in Prudhoe Bay area, bringing in nearly $1 billion in bonuses
December 18, 1971	*Alaska Native Claims Settlement Act becomes law
November 16, 1973	Trans-Alaska Pipeline Authorization Act becomes law permitting construction of 800-mile crude oil pipeline from Prudhoe Bay to Valdez, an ice-free port in southern Alaska
June 20, 1977	First oil enters trans Alaska pipeline and arrives at Valdez terminal 38 days later
December 2, 1980	*Alaska National Interest Lands Conservation Act becomes law, setting aside 1.5 million acres Arctic National Wildlife Refuge for further study of its petroleum potential and environmental impact. The act dictated study by Department of Interior and mandated that the Interior report its findings within 5 years to Congress. 1 study was delegated to U.S. Fish and Wildlife.
December 13, 1981	Kuparuk field, the second largest in Alaska, comes on stream west of the Prudhoe Bay field
February 1983	Final environmental impact statement for ANWR exploration published

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*Brief synopsis of law follows.

April 19, 1983	Final rules for geological and geophysical exploration published
Winters 1983-1984	Approximately 1,336 line miles of geophysical data acquired in ANWR Coastal Plain; no further geophysical work allowed
1985	Oilfield at Milne Point, north of the Kuparuk field, begins production
1985-1986	Exploratory well drilled by Chevron on Native Alaskan lands north of the Coastal Plain near the village of Kaktovik
April 1987	Secretary of the Interior's final report to Congress on ANWR recommends opening the Coastal Plain to petroleum operations
1988	U.S. Senate Energy Committee and House Merchant Marine and Fishing Committees report out bills authorizing leasing in ANWR but Congress adjourns before floor action is taken.

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*Brief synopsis of law follows.

1062C

ALASKA STATEHOOD ACT OF 1958
(16 U.S.C. 21)

Congress enacted the Alaska Statehood Act in 1958, making that territory the 49th state. In order to provide the fledgling state with a solid economic base, Section 6(b) of the new law authorized the state to select 102,550,000 acres from the federal public lands that were vacant, unappropriated and unreserved at the time of their selection. These selections were subject to any valid existing right, including any valid federal oil and gas lease.

Moreover, if state-selected lands contained a federal oil and gas lease, upon conveyance to the state, the state succeeded the federal lessor's interest. If only a portion of the land covered by a single lease was selected and conveyed to the state, the federal government reserved the minerals subject to that lease until the lease was terminated (at which time title to the minerals so reserved passed to the state).

The State of Alaska used its selection rights first to obtain title to land on the Kenai Peninsula (in southern Alaska), where oil had been discovered in 1957, as well as to well-known agricultural, recreational and mineral lands elsewhere in the state -- including lands near Alaska Native villages. Moreover, in 1964-65, the state chose -- some 1,650,000 acres of federal land along the North Slope, an area long suspected of having large oil deposits. The state held its first oil and gas lease sale in that area in 1964, followed by sales in 1965 and 1969. The 1969 sale, held after the Prudhoe Bay discovery, brought the state nearly $1 billion in bonuses.

Section 4 of the Statehood Act provided that the state disclaim right or title to any lands or other property(including fishing rights) whose title was held by Indians, Eskimos or Aleuts or held in trust by the federal government for those Natives.

These two actions -- the acquisition of land near the Native villages and the lease sales held for Prudhoe Bay tracts -- set the stage for conflict between the Natives and the state. It also paved the way for the enactment of the Alaska Native Claims Settlement Act of 1971.

1062C

ALASKA NATIVE CLAIMS SETTLEMENT ACT (ANSCA)
(43 U.S.C. 1601)

In 1966, the Alaska Federation of Natives and other regional Native associations were formed throughout the state. These groups filed protest with the Department of the Interior's Bureau of Land Management against the land selections made by the state of Alaska under the Alaska Statehood Act, as well as against the conveyance of those lands to the state by the federal government. Forty protests -- covering some 80 percent of the lands selected by the state, including the land at Prudhoe Bay -- had been filed by 1968. The Native protests cast a shadow on titles to the North Slope oil and gas leases and the Secretary of the Interior administratively ordered a moratorium on the issuance of new federal oil and gas leases in Alaska.

In response to the Native protests, in January 1969, the Secretary of the Interior promulgated Public Land Order No. 4582, which formally withdrew from disposal all unreserved federal lands in Alaska, resulting in the rejection of applications for federal noncompetitive oil and gas leases thereafter filed. This effectively halted the state selection process and other dispositions. The secretary's action was sustained by a federal circuit court.

The Alaska Native Claims Settlement Act (ANCSA) was enacted on December 18, 1971, to resolve these conflicts. The law:

* extinguished aboriginal rights to lands claimed by Natives;
* provided for the establishment of 13 Native regional corporations and an unlimited number of Native village corporations by qualifying villages;
* allowed these village corporations to select the surface estate in land surrounding their respective villages;
* provided for the conveyance of the subsurface estate beneath the village corporation lands to the regional corporations, and granted certain other land rights to the regional corporations; and
* gave the Secretary of the Interior additional authority to withdraw unreserved public lands.

Under ANSCA, the Natives were given the right to acquire some 44 million acres of land. Of this, the village corporations were allowed to obtain surface estates to some 22 million acres, with the subsurface rights to those lands belonging to the regional corporation in which the village was located. However, the village corporation could veto any oil or gas activities in the subsurface area within its boundary. In addition, the regional corporations were entitled to select 16 million acres of surface and subsurface estate outside of the areas set aside for village selection.

Any pre-existing federal oil and gas lease was not affected by ANSCA, except that -- when leased land was conveyed to a Native corporation -- the Native corporation was substituted for the United States government as lessor. However, the federal government continues to administer any valid existing lease, right of way, easement or permit, unless the right to so administer has been waived. In contrast with the Alaska Statehood Act, under ANCSA, lease applications pending on the date of the Native selection were held not to be valid existing rights.

1062C

ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT (ANILCA) (16 U.S.C. 410)

The Alaska National Interest Lands Conservation Act of 1980 (ANILCA), signed into law on December 2, 1980, contains a number of provisions affecting petroleum operations on federal lands in that state, including the area identified as the "Coastal Plain" of the Arctic National Wildlife Refuge (ANWR). Among the principal petroleum-related provisions, ANILCA:

* allowed surface exploratory activity on some 1.5 million acres of the Coastal Plain of that 19-million acre refuge, to permit the Department of the Interior (DOI) to assess the area's petroleum potential; and mandated the establishment of environmental guidelines, should Congress permit drilling and production activities at some later date;

* added several new areas to the national park system which, subject to valid existing rights, were expressly withdrawn from mineral development, including petroleum operations;

* added several million acres in different areas to the National Wildlife Refuge System, where oil and gas leasing may be permitted only if deemed compatible with the purposes of the refuge;

* added several wild and scenic river segments,withdrawing them from operations under both the mining and mineral leasing laws; and

* added several segments to the national forest system, with varying approaches to mineral leasing.

North Slope and Arctic National Wildlife Refuge

The act mandated several Alaskan land studies and assessments of (1) some federal lands on the North Slope, (2) the Arctic National Wildlife Refuge and (3) all federal lands in Alaska other than North Slope lands.

The study required by Section 1002 to be conducted in the ANWR Coastal Plain was to:

* assess the size, range and distribution of fish and wildlife populations;

* determine the extent, location and carrying capacity of the fish and wildlife habitats;

* assess the impact of human activities and natural processes on fish and wildlife and their habitats;

* analyze the potential impact of oil and gas exploration, development and production on such wildlife and habitats;

* analyze the potential effects of such activities on the culture and lifestyle of affected people; and

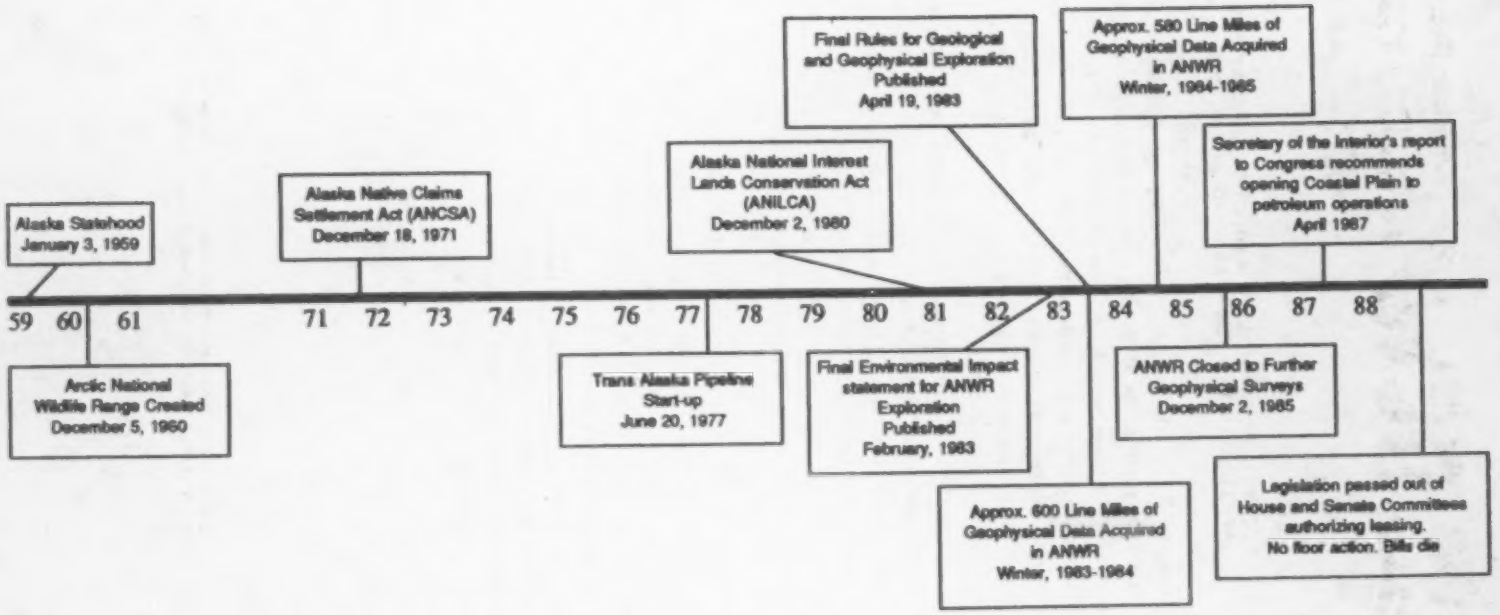
* report to Congress its findings and recommendations.

Although Section 1003 of the act expressly prohibits leasing and other development leading to production in the Coastal Plain without congressional authorization, it directs the Secretary of the Interior to establish guidelines for limited exploration activities.

The Section 1002 study, which included geophysical and geological work but no actual drilling for oil and natural gas, was completed and a draft report was released for public review in November 1986. The final report -- issued in April 1987 -- recommended opening the 1.5-million acre ANWR Coastal Plain study area to petroleum exploration and production.

1062C

Important Dates in ANWR Legislative History


Alaska Statehood
January 3, 1959
Alaska Native Claims Settlement Act (ANCSA)
December 18, 1971
Alaska National Interest Lands Conservation Act (ANILCA)
December 2, 1980
Final Rules for Geological and Geophysical Exploration Published
April 19, 1983
Approx. 580 Line Miles of Geophysical Data Acquired in ANWR
Winter, 1984-1985
Secretary of the Interior's report to Congress recommends opening Coastal Plain to petroleum operations
April 1987
59 60 61 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
Arctic National Wildlife Range Created
December 5, 1960
Trans Alaska Pipeline Start-up
June 20, 1977
Final Environmental Impact statement for ANWR Exploration Published
February, 1983
ANWR Closed to Further Geophysical Surveys
December 2, 1985
Approx. 600 Line Miles of Geophysical Data Acquired in ANWR
Winter, 1983-1984
Legislation passed out of House and Senate Committees authorizing leasing.
No floor action. Bills die

American Recreation Coalition
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Mary Beth Keller

RECREATION COMMUNITY REGISTERS SUPPORT FOR ARCTIC COASTAL PLAIN LEASING ACT OF 1987

Washington, D. C. (October 14) -- "Recreation was a major victim during the energy crises of the 1970's when certain government officials displayed a hostile attitude toward the consumption of energy for leisure and recreational pursuits," said American Recreation Coalition President Derrick Crandall in testimony before the United States Senate Energy and Natural Resources Committee in support of S. 1217, "The Arctic Coastal Plain Public Lands Leasing Act of 1987."

Today, Crandall stated, "recreation is a $300 billion per year industry in America and should not be singled out in the face of energy shortages."

Permitting oil leasing in the Arctic National Wildlife Refuge (ANWR), Crandall said, will greatly help to ensure America's energy future. "The 1.5 million acres of the 1002 coastal plain area, unique for its potential to contribute so greatly to this nation's energy security, should not be locked away as wilderness."

"Few are more concerned about or dependent upon the quality of lands and wildlife than the recreation community," concluded Crandall. "We are committed to the protection and enhancement of America's natural resources. In the case of the Coastal Plain of ANWR, we believe that the environment need not be and will not be sacrificed if oil and gas exploration and development are permitted on a careful basis."

In addition to Crandall's statement, letters from a variety of recreation interests -- many of whom participated in ARC's inspection of the Coastal Plain -- were submitted as testimony.

(more)

Recreation Supports ANWR Leasing
ADD ONE

Elden Smith, Senior Vice President of the RV group of Fleetwood Enterprises, the world's largest manufacturer of recreational vehicles (RVs) and manufactured housing, said in his letter to the Committee:

> "Our employees' livelihoods and the future success of our business depends on adequate supply of gasoline being available. We feel strongly that the energy supplies of ANWR must be explored and that any resources found can be recovered without damage to the environment."

David McCoy, founder and President of Mammoth/June Ski Resort in California, wrote:

> "At Prudhoe Bay, everything was spotlessly clean and unrecognizable as being part of a traditional oil field. We saw caribou on the tundra and birds of all species along the road. As a result of my visit, I have a whole new appreciation of the value of energy and now realize that in the United States, Alaska has the greatest reserve of energy in the form of oil. If we do not want to depend on outside sources, then we need to allow exploration now in ANWR."

Merle Karst, Senior Vice President of Yamaha Motor Corporation, U.S.A., said:

> "We rely more and more on oil imports. Logic and wisdom should prevail in this matter. I encourage positive action to take advantage of this important resource (ANWR) for the benefit and protection of this country. It is best if we drill now and produce for the future."

Bill Estes, Vice President of TL Enterprises, Inc., a publisher of RV lifestyle magazines, wrote:

> "I believe the exploration proposal is responsible and reasonable, in view of this nation's obvious critical need for development of petroleum resources. A majority of our 500,000 readers agree. It was obvious during my Prudhoe visit that the oil companies have done a fine job of minimizing the effect of their work on wildlife and the land."

Edwin Kibler, Legislative Director of the National Campers and Hikers Association, wrote in his letter:

> "NCHA suffered greatly during the energy crises of the 1970's. The availability of fuel is essential for continued outdoor recreation. Congress should not delay making decisions which will secure America's energy future. The coastal plain of ANWR represents the best potential on-shore source of oil in all of North America. Congress can act now by allowing exploration and development of the 1002 area in ANWR. With the 10-year completion date for production; far less impact would occur now than if development occurred on short notice."

(more)

Recreation Supports ANWR Leasing
ADD TWO

Darryl Harris, President and Publisher of Harris Publishing, Inc., remarked:

"As a snowmobiler, trailbiker, ATVer, boater, highway motorcycle tourer, and magazine publisher who represents those recreation interests throughout the western U.S., I would hope that our government would pursue a policy that would develop energy resources within our borders and place us less dependent on foreign oil."

John Zimmerman, President of the Sunline Coach Company, said:

"Exploration of ANWR should be done while we still have time to use all the precautionary measures to do it safely, rather than waiting until we have an energy crisis and doing it hastily, thus jeopardizing the environment. The record that has been demanded, expected and experienced at Prudhoe Bay should also be expected at ANWR. If no oil is found, we have lost nothing. If, on the other hand, oil is found, we will have insulated ourselves against another oil embargo."

Michael Schneider, Vice President and Publisher at TL Enterprises, wrote in a recent editorial:

"The care that's been taken in Prudhoe Bay is testimony to the fact that big oil and the natural land can co-exist. Postponing the leasing decision until an oil crisis is upon us guarantees there will be fewer restraints that now maintain environmental sensitivity. The solution is clearly to begin development now -- at a time when we can best balance the environmental concerns with the need to supply energy."

Copies of Mr. Crandall's testimony are available from the American Recreation Coalition.

-30-

#87-20
10/14/87

Statement of

The Associated General Contractors of America

Presented to the

Committee on Energy and Natural Resources

United States Senate

on the Subject of

Oil and Gas Leasing in the

Arctic National Wildlife Refuge

S. 1217

October 13, 1987

AGC is:

- More than 32,500 firms including 8,000 of America's leading general contracting firms responsible for the employment of 3,500,000-plus employees;
- 105 chapters nationwide;
- More than 80% of America's contract construction of commercial buildings, highways, industrial and municipal-utilities facilities.

The Associated General Contractors of America represents more than 32,500 firms, including 8,000 of America's leading general contracting companies which are responsible for the employment of more than 3,500,000 individuals. These member contractors perform more than 80 percent of America's contract construction of commercial buildings, highways, industrial and municipal-utilities facilities.

AGC is pleased to submit for the record, the following statement of the association's position in conjunction with current hearings on S. 1217, a bill to authorize oil and gas leasing, exploration and development within the coastal plain of the Arctic National Wildlife Refuge (ANWR) in Alaska.

AGC, by resolution adopted at its 68th Annual Convention, March 5-10, 1987, urged "that the Congress open the coastal plain of the ANWR to environmentally responsible oil and gas leasing, exploration, development and production."

The Arctic National Wildlife Refuge is a 19 million acre area on the Northeast coastal plain of Alaska. 65 miles to the west lie the Prudhoe Bay oil fields and adjacent on the east are the MacKenzie oil fields in Canada. 8 of the 19 million acres of ANWR are designated as wilderness. In 1980, Congress set aside 1.5 million acres of the refuge for further study of its resource and wilderness value. No oil activity was allowed pending completion of the study, and until Congress enacted legislation specifically authorizing the activity. The Department of the Interior was directed to make this in-depth study and submit its report within 5 years. In November 1986, the Department issued its draft report urging Congress to open this area to oil and gas operations under strict environmental guidelines.

On April 20, 1987, Interior Secretary Hodel released the final report on the hydrocarbon and wildlife resources of the Coastal Plain. The Department's projections deal with major oil and gas fields and potential reserves which rival, perhaps even exceed those of Prudhoe Bay, the nation's largest oil discovery. The study concludes that the Coastal Plain of ANWR may be the most outstanding oil and gas frontier remaining in the United States and recommends that the entire 1.5 million acre area be opened for oil and gas leasing, under prudent environmental regulations.

Currently, Prudhoe Bay and Alaska's North Slope provide more than 20 percent of the nation's total domestic crude oil production. These resources are now in significant decline and are not being replaced. The 1.5 million acre Coastal Plain has the potential for enabling Alaska's North Slope to continue to provide a major alternative to imported oil and a very substantial contribution to national petroleum needs.

National energy forecasters now predict that oil imports

may increase from the current 35 percent of the U.S. market to 50 percent by the 1990s. U.S. imports from the volatile Persian Gulf area increased 300 percent in 1986 and accounted for more than half the total increase in imports that year.

At the same time, production from current U.S. reserves is expected to decline considerably from the present 8 million barrels of oil per day to less than 3 million in the late 1990s. To compensate for this loss of production, new discoveries of domestic oil must be developed or imports will have to be increased. Much of this decline will be attributable to decreased Prudhoe Bay production, which in 1986 averaged 1.5 million barrels-per-day but will fall to 280,000 barrels-per-day by the year 2000.

It is anticipated that the earliest ANWR production could begin is 1998 to 2000 -- even if Congress approves exploration in 1987. By 2000, because of the Prudhoe Bay decline, the Trans-Alaska Pipeline System will be operating at 25 percent of its 2 million barrel-per-day capacity. ANWR development would fully utilize the pipeline and deliver critical domestic oil.

The need for orderly domestic oil and gas development has been clearly demonstrated. Also amply demonstrated is the fact that the development can be done in a way to protect the environment and wildlife.

Numerous laws and regulations assure that oil and gas activities can protect the surrounding environment. Experience in Alaska and the lower 48 states shows that oil and gas activities are consistent with other goals such as wildlife protection. Nearly 20 years of experience on the North Slope demonstrates that helping to meet the nation's energy needs and protecting our wildlife and environment are functions that can coexist to the benefit of all. Techniques employed to minimize disturbance include directional drilling, smaller and consolidated facilities, winter construction, use of temporary ice roads, special arctic equipment and elevated pipelines and facilities.

Because of the extremely long lead times needed to bring oil fields into production in the arctic, it is important that Congress move expeditiously to enact legislation to permit oil exploration and development of the Arctic National Wildlife Refuge in an environmentally responsible manner.

AGC strongly urges the Congress to do so.

National Association of Home Builders
15th and M Streets, N.W., Washington, D.C. 20005
Telex 89-2600 (202) 822-0400 (800) 368-5242

James M. Fischer, Jr.
1987 President

August 19, 1987

The Honorable J. Bennett Johnston
Chairman
Committee on Energy and Natural Resources
136 Senate Hart Office Building
United States Senate
Washington, DC 20510

Dear Chairman Johnston:

On behalf of the more than 147,000 members of the National Association of Home Builders (NAHB) I am writing to ask for your support for oil exploration, development, and production in the Coastal Plain of the Arctic National Wildlife Refuge (ANWR).

The United States Department of the Interior's report to Congress urges development within only a small portion of ANWR —1.5 million acres out of 18 million. The oil industry, through its efforts at Prudhoe Bay, has adequately demonstrated that exploration for oil and protection of the fragile Arctic environment are not mutually exclusive.

Taking into account the lengthy amount of time needed to bring new oil fields online, we urge you to move rapidly toward increased American energy independence. The development of the Coastal Plain's natural resources is also vitally important to the Alaskan economy and the benefits from drilling and production will certainly spread throughout the rest of the nation.

The homebuilding industry is especially supportive of this effort as many important products are manufactured from petroleum. In addition, our builders need an uninterrupted and cost-effective supply of fuel for their machinery.

When Congress reconvenes, we urge you to hold hearings before the Committee on Energy and Natural Resources to discuss this important issue, and to cosponsor legislation to support oil exploration in the ANWR Coastal Plain.

Thank you for taking the time to consider our views.

Sincerely,

James M. Fischer, Jr.

James M. Fischer, Jr.
President

AMERICAN FARM BUREAU FEDERATION

October 23, 1987

The Honorable J. Bennett Johnston, Chairman
Senate Energy and Natural Resources Committee
United States Senate
Washington, DC 20510

Dear Senator Johnston:

We request that this letter be included in the hearing record on the Arctic National Wildlife Refuge (ANWR) coastal plain.

The American Farm Bureau Federation, our nation's largest organization of farmers and ranchers, endorses the U.S. Department of the Interior's recommendation that Congress enact legislation to permit oil and gas exploration on the Arctic National Wildlife Refuge (ANWR) coastal plain.

While meeting in Anaheim on January 15, 1987, delegates to our national convention adopted a resolution supporting the development of energy in Alaska's coastal plain. This resolution originated with the Alaska Farmers and Stockgrowers Association (Alaska Farm Bureau) which adopted the position at its annual meeting in November 1986. It states:

> "We urge Congress to open the Alaska Arctic National Wildlife Refuge Coastal Plain to environmentally responsible oil and gas exploration, development and production."

The Farm Bureau believes that it is imperative that our nation develop all its sources of energy. Adequate and consistent supplies of energy are critical if agriculture is to continue to meet our nation's demands for fuel and fiber.

Nearly 80 percent of the energy used in agricultural production is derived from petroleum. Petroleum fuels have been an important contributor to the dramatic gains in agricultural productivity during this century.

Current economic conditions in both U.S. agriculture and energy industries make it all the more important that domestic oil and natural gas production be encouraged and the dependence on oil imports be minimized. United States agricultural and energy needs require that areas of potentially vast oil and gas resources, such as the Alaska coastal plain, not be closed off to energy exploration and development.

The American Farm Bureau Federation, for our more than three million families nationwide, urges Congress to open the ANWR coastal plain for oil and gas exploration and development.

Sincerely,

John C. Datt
Executive Director
Washington Office

JCD/laf
cc: Committee Members

MANUFACTURING CREATES AMERICA'S STRENGTH

Statement
of

The National Association of Manufacturers

ON PROPOSED
OIL AND GAS LEASING IN THE
ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA

Before the Energy and
Natural Resources Committee
United States Senate

June 23, 1987

National Association of Manufacturers
1331 Pennsylvania Avenue, NW, Suite 1500 — North Lobby
Washington, DC 20004-1703 (202) 637-3000

The National Association of Manufacturers is a voluntary business association of more than 13,500 corporations, large and small, located in every state. Members range in size from the very large to the more than 9,000 smaller manufacturing firms, each with fewer than 500 employees. NAM member companies employ 85 percent of all workers in manufacturing and produce more than 80 percent of the nation's manufactured goods. NAM is affiliated with an additional 158,000 businesses through its Associations Council and the National Industrial Council.

Executive Summary

NAM supports action to open up the Coastal Plain of the Arctic National Wildlife Refuge (ANWR). Our interest in the Coastal Plain stems from the fact that our nation needs an adequate and secure supply of energy at competitive prices to sustain economic growth. Unfortunatly, recent trends in the oil and gas sector reflect a rising U.S. dependence on imported oil. U.S. pertroleum imports were approximately 6 million barrels a day in 1986--the highest level since 1980. If this trend continues, imports could make up nearly 50-60 percent of U.S. needs by 1995.

Such heavy reliance on oil imports could further weaken the U.S. economy, which is why it is imperative that this nation prepare for the future and take action to explore and develop domestic resources including the Coastal Plain of ANWR. In addition, it is also important to note that exploration and development can co-exist with wildlife and strict environmental considerations. One need only look next door to Prudhoe Bay to see that energy resources can be developed in an environmentally safe and responsible manner.

The decisions we make today on ANWR will help to determine how vulnerable we are to imported oil in the near future. NAM, therefore, ugres you to support legislation, which would give the United States the opportunity to explore for resources that we urgently need.

Statement
of

The National Association of Manufacturers

ON PROPOSED
OIL AND GAS LEASING IN THE
ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA

Before the Energy and
Natural Resources Committee
United States Senate

June 23, 1987

This statement is submitted on behalf of the National Association of Manufacturers (NAM) in response to the committee's hearings on Alaska's Arctic National Wildlife Refuge (ANWR). NAM supports legislative action that would open up the Coastal Plain of the Arctic National Wildlife for oil and gas exploration, development and production.

NAM's interest in ANWR stems from the fact that our association's membership constitutes major users of energy as well as most of the domestic producers. Despite the diversity of NAM membership interests, however, it is safe to say that they're all concerned with international competitiveness, the balance of trade, the federal deficit, national security, and, of course, the health of our domestic economy.

FOREIGN OIL IS DISPLACING U.S. OIL IN THE U.S. MARKET

Today, America's energy producers are rapidly losing ground to imports in the oil marketplace. National energy forecasters now predict that oil imports may increase from 35 percent of the U.S. market to 50-60 percent by the mid 1990s. Furthermore, U.S.

imports from the volatile Persian Gulf area have increased 300 percent in 1986 and accounted for more than half of the total increase in imports last year.

But, even with immediate access to high potential areas such as ANWR, this picture will not improve short-term. Exploration and development of Arctic oil and gas usually takes more than ten years from the initial discovery to first production. Consequently, any production from this area is not likely to occur much before the end of this century. At that time, oil production from current U.S. reserves is expected to have declined considerably from the present level of over 8 million barrels per day (bpd) to less than 3 million bpd, and Prudhoe Bay production, which in 1986 is averaging 1.5 million bpd, will have declined (according to the State of Alaska, Department of Revenue) to 280,000 bpd in the year 2000. To compensate for this loss of production, new discoveries of domestic oil must be developed or imports must be increased. There are few alternatives.

But despite its relative inaccessibility, ANWR is actually a valuable potential source of domestic oil, in part due to the in-place infrastructure resulting from Prudhoe Bay development.

TRANS-ALASKA PIPELINE ENHANCES COMPETITIVENESS OF THE ANWR RESOURCES

It should be remembered when considering development of ANWR that the Trans-Alaska Pipeline System (TAPS), which was completed in 1977 and cost approximately 10 billion dollars, is already in place. The close proximity of TAPS to the ANWR region only enhances the resource potential for this area and other economic reasons make ANWR

attractive.

The approximate $10 billion cost to place TAPS in operation represents a sunk cost: if capacity is fully used, the marginal cost of utilizing TAPS is independent of this cost and is quite low.

Since the cost of producing petroleum resources at any site includes development and transportation, the availability of TAPS capacity to transport potential North Slope production at ANWR and elsewhere represents a significant cost advantage versus a site where a more expensive transportation option is required.

This cost advantage resulting from the availability of relatively inexpensive TAPS capacity means that fewer resources need to be expended to produce the petroleum resources in ANWR than at a comparable site lacking in-place transportation facilities.

Consequently, the availability of throughput capacity at TAPS for potential ANWR production is not only valuable in that it will help keep out foreign imports, but it will also be economically competitive.

ENVIRONMENTAL CONCERNS

"Economically competitive" however does not exclude "environmentally compatible" development. Opposition to petroleum operations on the ANWR plain arises from the concern that wildlife species and habitat will be significantly harmed. Although any sizeable petroleum operation will have some impact upon the environment, previous experience

demonstrates that ANWR resources can be used in a safe and responsible manner.

One need only look "next door" to the Prudhoe Bay operations. It has been proven that industry and environment can coexist in a multiple use land management program.

In fact, several major problems have been resolved as a result of the Prudhoe Bay operation. Aside from the hostile climate and difficult logistics of operating in an extremely remote location, the most challenging technical problems encountered and solved in the onshore Arctic were related to permafrost.

From the years of operating experience there has been developed an environmental protection technology to minimize, and in some cases eliminate, long term changes in the tundra. For example, low-pressure tired vehicles have been developed which can cross the tundra without crushing the vegetative mat or scouring the soils as tracked vehicles might.

The issue of the caribou is of course a concern. Again, Prudhoe Bay serves as an example. When the Prudhoe Bay oil field was developed in the mid-1970s, regulatory agencies acted cautiously and studies were conducted to determine the effects on the Central Arctic caribou herd. In fact, the results of the studies and the tools implemented to prevent damage to the Central Arctic herd were quite positive, in that the herd has increased at a rate of 12-18 percent per year over the past decade. At more than 13,000, it numbers at least four times what it did in 1975 before most of the Prudhoe Bay development activity began. The positive results from Prudhoe Bay and other similar experiences from northern

Europe and the Soviet Union, prove that herds can exist in the presence of industrial development, including oil fields and railroads. Wildlife habitats, environmental values, and the petroleum industry can and do coexist.

CONCLUSION

As important as ANWR is, it's only one piece of the major energy puzzle. ANWR is what could rescue this nation from foreign imports and provide for some energy needs well into the 21st century. We must be able to plan for future needs, and ANWR can play a role in meeting these needs, in the context of comprehensive energy planning.

NAM supports the recent proposal, S. 1217 offered by Senator Murkowski which would "authorize the Secretary of the Interior to lease, in an expeditious and environmentally sound manner, the public lands within the Coastal Plain of the North Slope of Alaska for oil and gas exploration, development and production."

In addition, NAM supports Rep. Young's bill H.R. 1082, which also proposes to authorize oil and gas leasing and exploration in the Coastal Plain of ANWR.

NAM's long-standing policy has been that public land should not be closed to or restricted from resource development and nonwilderness multiple uses in the absence of compelling national interests that override the need for adequate domestic oil, natural gas and other valuable resources. Before areas are set aside for exclusive uses, every effort should be made to determine the availability of materials and other resources on the proposed set asides, and access should be assured to explore and develop the area's resources.

United States' energy policy should be oriented towards significantly reducing our nation's dependence on imported energy resources. The development of domestic energy resources, such as those contained in ANWR, are the best hope to reduce America's energy vulnerability, and enhance the ability of U.S. manufacturers to be more competitive in world markets. We must take action against economic influences brought on by unstable energy markets that don't allow for proper planning of manufacturers' energy needs and the producers' opportunity to explore. Thank you for the opportunity to express our views.

Statement of the Chamber of Commerce of the United States

ON: .UNITED STATES DEPARTMENT OF INTERIOR'S ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA COASTAL PLAIN RESOURCE ASSESSMENT

TO: SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

BY: SUSAN CONNOLLY MOYA

DATE: JUNE 12, 1987

The U.S. Chamber of Commerce is the world's largest federation of business companies and associations and is the principal spokesman for the American business community. It represents approximately 180,000 businesses and organizations, such as local/state chambers of commerce and trade/professional associations.

More than 91 percent of the Chamber's members are small business firms with fewer than 100 employees, 58 percent with fewer than 10 employees. Yet, virtually all of the nation's largest companies are also active members. We are particularly cognizant of the problems of smaller businesses, as well as issues facing the business community at large.

Besides representing a cross section of the American business community in terms of number of employees, the Chamber represents a wide management spectrum by type of business and location. Each major classification of American business—manufacturing, retailing, services, construction, wholesaling, and finance--numbers more than 11,000 members. Yet no one group constitutes as much as 29 percent of the total membership. Further, the Chamber has substantial membership in all 50 states.

The Chamber's international reach is substantial as well. It believes that global interdependence provides an opportunity, not a threat. In addition to the 56 American Chambers of Commerce Abroad, an increasing number of members are engaged in the export and import of both goods and services and have ongoing investment activities. The Chamber favors strengthened international competitiveness and opposes artificial U.S. and foreign barriers to international business.

Positions on national issues are developed by a cross section of its members serving on committees, subcommittees and task forces. Currently, some 1,800 business people participate in this process.

STATEMENT
on
UNITED STATES DEPARTMENT OF INTERIOR'S
ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA
COASTAL PLAIN RESOURCE ASSESSMENT
for submission to the
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
by
Susan Connolly Moya*
June 12, 1987

The U.S. Chamber of Commerce appreciates this opportunity to express its support for the Department of the Interior's recommendation that Congress enact legislation making the entire Coastal Plain portion of the Arctic National Wildlife Refuge (ANWR) in northeastern Alaska available for oil and gas leasing, with necessary environmental safeguards.

The Chamber supports the Department of the Interior's recommendation to open the Coastal Plain of the ANWR to oil and gas development because the potential supplies would help to meet future energy requirements; strengthen the national economy; diminish U.S. dependence on foreign oil; create jobs; reduce the nation's huge balance of trade deficit; and provide a steady, large, and greatly needed source of income to the federal treasury.

The Chamber is concerned greatly about the adequacy and security of America's energy supplies. It is troubled by the fact that oil consumption in the U.S. has exceeded domestic production for more than 20 years and by projections indicating that the U.S. could be importing almost one-half of its oil by as early as 1990 under certain, not unrealistic conditions.

It is generally agreed that the 1.5 million-acre Coastal Plain in the ANWR contains the nation's most promising onshore frontier for major oil and gas prospects. Although expert opinion is divided over the size of the ANWR's petroleum resources, which is typical for any area before exploratory

*Manager, Energy and Natural Resources Policy

drilling, analyses of geologic studies and surveys predict a 95 percent chance of the Coastal Plain's containing more than 4.8 billion barrels of oil and 11.5 trillion cubic feet of gas and a five percent chance of its containing more than 29.4 billion barrels of oil and 64.5 trillion cubic feet of gas. No definitive data are available because current law prohibits even exploratory drilling in the ANWR Coastal Plain; therefore, estimates of the size of the reserves cannot be confirmed. Exploration is needed to make this range more definitive.

The Coastal Plain is prized not only for its oil and gas potential but also for its valuable wildlife. While the Chamber supports oil and gas exploration and development on the Coastal Plain, it cautions that extreme care must be taken to protect the valuable natural resources of this national treasure. It would encourage and support regulations based on the positive past experiences in arctic climates to ensure environmental integrity in all oil and gas operations in the area.

Experience shows that oil and gas development can be compatible with the Alaskan environment and wildlife. Petroleum operations on the adjacent Prudhoe Bay/North Slope coastal plain clearly demonstrate this. Based on the North Slope operations, the Chamber believes that oil and gas development would not adversely affect the Coastal Plain. In fact, technology and experience from North Slope activities will be used and improved in the ANWR.

Because of the 10 to 15-year lead time required for oil and gas development in the Arctic, steps must be taken now to encourage, with appropriate environmental safeguards, oil production on all of the most promising federal lands, particularly the Coastal Plain area of the ANWR.

We must keep in mind that authorizing the lease of the Coastal Plain for oil and gas exploration and development does not mean development and production today--rather it is an insurance policy for tomorrow. The recent gyrations of the oil market emphasize the need for a long-term view.

America's Energy Needs Are Growing, and Supplies Are Shrinking.

The U.S. relies on oil and natural gas to meet two-thirds of its energy requirements. The need for oil is growing; and efforts to develop alternative sources, such as synthetic fuels, have fallen short of expectations. Therefore, for the foreseeable future, oil must continue to be the principal fuel on which the nation depends.

The U.S. must find 32 billion barrels of domestic oil during the next 10 years to replace what is being used. In fact, three-quarters of the oil that the U.S. must have in the year 2000—just 13 years from now—still has to be found. Despite this fact, domestic oil production in the "lower 48" states, including offshore wells, has declined substantially during the past decade. And, due in large part to the oil price decline, experts predict that by the end of this year, domestic production will decline by as much as or more than a million barrels per day. In contrast, consumption is expected to continue to increase. Last year it grew by more than three percent, from approximately 15.7 to an estimated 16.2 million barrels per day, doubtless due to increased economic activity, population growth, lower prices, and perhaps due to other reasons.

Also troublesome to the Chamber is that American oil reserves, that portion of our resources that has been located with considerable certainty and that can be economically recovered with present technology, have been steadily shrinking. These are estimated to hit the lowest levels since shortly after World War II by 1990. All of the onshore basins in the U.S. with the greatest potential for giant fields have already been explored, except the Coastal Plain of the ANWR.

Since the U.S. began drilling for oil more than a century ago, it has produced about 50 percent of the estimated onshore oil and gas reserves and 20 percent of the estimated offshore reserves. Although America's Outer Continental Shelf, those lands beyond the three-mile state boundary, holds

great prouise, only 15 percent of all offsnore drilling exploration wells have been successful. Because of this limited success, knowing what the potential oil and gas resources are in the Coastal Plain of the ANWR is more important than ever.

Oil Imports Could Double by the Mid-1990's and Cost Billions of Dollars Annually.

In October, the National Petroleum Council (NPC) issued an interim report entitled U.S. Oil and Gas Outlook in which the NPC presented the U.S.'s near-term and longer-term oil import outlook as going from grey to "utterly black."

Specifically, in sharp contrast to 1985 when U.S. imports of crude oil and petroleum products were only 27 percent of domestic consumption, the NPC study projects that, depending upon whether future prices follow a relatively low or a relatively high path, the acceleration in the decline of future domestic production, accompanied by even moderate increases in consumption, could result in imports of 35 percent to 50 percent of consumption by 1990, 45 percent to 60 percent by 1995, and 50 percent to 70 percent by the year 2000.

To put these figures in perspective, when the Arab oil embargo began in 1973, the U.S. was importing about one-third of its oil—about six million barrels per day. Despite drastic increases in oil costs, imports continued to rise to almost 10 million barrels per day by early 1977. After that, oil imports gradually declined to less than four million barrels per day by early 1983. Since that time, however, imports have surged; and today the U.S. is importing more than one-third of its oil requirements.

According to the American Petroleum Institute (API), U.S. oil imports from the Persian Gulf have increased by more than 400 percent during the past year. These imports accounted for 16.6 percent of total U.S. imports in December, 1986, versus only four percent in November 1985. This increased reliance on Persian Gulf oil seriously threatens the nation's energy and national security.

Petroleum imports represent a significant component of all U.S. imports. In 1983, 1984, and 1985, net payments for imported oil amounted to almost $53 billion—costing Americans an average of one billion dollars per week. Imported oil payments continue to be one of the largest factors in the U.S. trade deficit; last year they amounted to about one-third. According to the Department of the Interior's report, production from the Coastal Plain of the ANWR could reduce foreign dependence on oil and gas by almost nine percent in the year 2005 and save Americans billions of dollars per year.

Unless steps are taken now to increase development of domestic petroleum resources, the U.S. will become continually more reliant upon foreign suppliers. As long as the U.S. continues to import oil, it continues to export dollars and jobs.

Drilling for New Oil and Gas Is Critical Despite Current World Oil Surplus.

World oil prices are at their lowest in a decade, and oil companies—as a result of depressed earnings—are announcing reductions in their capital and exploration expenditures. Why then, with oil companies having less money to allocate, is it more important than ever that the Coastal Plain of the ANWR be made available for oil and gas exploration and development and not be declared as "wilderness," i.e., permanently closed to exploration and development, as has been suggested?

Experience tells us that when prices fall, demand inevitably rises, production declines, and the surplus disappears. America should not be lulled by the current surplus of oil in the world market; it must think of the future. The recommendation of the Department of the Interior that Congress enact legislation declaring the entire Coastal Plain available for oil and gas leasing is sound. Industry must be allowed to invest its limited financial resources most efficiently, i.e., in areas with the greatest development potential.

Unfortunately, the current talk of an oil "glut" has created the false impression that America need not worry about its petroleum or other energy supplies now or in the future. This has caused some to advocate that the U.S. delay energy development programs. However, those who propose the delay ignore the long lead time necessary for industry to find and produce energy sources. In the Arctic, this could mean as many as 10 to 15 years. They also iguore how the U.S.'s dependency affected it a decade ago and how it is affecting it now.

Other Benefits Would Accrue to the U.S. from Leasing the Coastal Plain of the ANWR.

Income to the U.S. Treasury. Revenues generated by petroleum exploration and development in the Coastal Plain would benefit not only the federal and Alaskan state governments but also the economy throughout the U.S. The Department of the Interior's report predicts that the net national economic benefits from oil production on the Coastal Plain will total $8.0 billion (present discounted value). The State of Alaska would receive a share of the federal revenue and an estimated $3.6 billion in tax payments related to leasing. In 1984, Alaska received about $1.4 billion in oil and gas royalties, rents, and bonuses.

Creation of Job Opportunities. Another benefit that would accrue from oil and gas operations is a boost in employment nationwide because supplies and services for such operations come from throughout the nation. Depending upon the amount of oil and gas discovered on the Coastal Plain, the API predicts that national employment gains would range from 138,000 to 1,021,000 jobs.

Environmental Concerns.

It cannot be overemphasized that the human use of the ANWR's resources must not be allowed to diminish its aesthetic and refuge values. The Chamber strongly supports the recommendation that the Secretary of the Interior be authorized to impose necessary and appropriate measures to protect refuge

resources and ensure coordinated and efficient oil and gas activities, and it recognizes that developing the entire Coastal Plain of the ANWR could have some environmental consequences and would eliminate the "wilderness" character of that area. However, the most adverse effects could be mitigated by using the lessons learned and the technology acquired from development at Prudhoe Bay and from construction of the Trans-Alaska Pipeline. The evidence there showed that petroleum operations are compatible with the conservation of the land's natural values.

In discussing whether oil and gas operations should be permitted on the Coastal Plain of the ANWR, it is important to remember that the ANWR is only one component of an almost 90 million-acre National Wildlife Refuge System. By law, any activity occurring in a national wildlife refuge must be "compatible with the principles of sound wildlife management and will otherwise be in the public interest" (50 CFR Section 32.1). Experience in other refuges shows such compatibility.

A recent survey of oil and gas activities in 43 refuges in the contiguous 48 states, including 19 refuges with oil and/or gas production, found that oil and gas operations had little or no adverse effects on refuge wildlife or on other economic or recreational uses. This has also been true in Alaska in the Kenai National Wildlife Refuge and in sensitive areas of the North Slope.

Forty years of experience on the North Slope have demonstrated that oil development can and does exist in harmony with the environment. Techniques used to minimize disturbance include directional drilling, smaller and consolidated facilities, winter construction, use of temporary ice roads, use of special equipment, and elevated pipelines and facilities.

All activities on the ANWR would be monitored by the Fish and Wildlife Service, the State of Alaska, and the North Slope Borough. Moreover, if oil and gas exploration is allowed on the Coastal Plain, only a few, temporary

drill sites of less than 10 acres would be required to verify commercial reserves of hydrocarbons. And, if a discovery is made, only a small area of the refuge would be developed.

According to API, the operating area in the Coastal Plain of a field the size of Prudhoe Bay would cover 130,000 acres, which would be about 8.5 percent of the Coastal Plain. The actual surface area affected by pads, roads, etc. would be approximately one percent of the operating area, less than 0.1 percent of the Coastal Plain.

Millions of acres in Alaska already have been leased and explored, and now the ANWR clearly has the most potential for major oil production. Exploration for oil and gas must take place where they may be located, not where we would like them to be. With the rapid rate at which our reserves have declined, exploring the most promising areas first only makes sense. The ANWR should be explored because it combines maximum potential with good access and an established nearby transportation facility.

Alaska already has vast "wilderness" areas. The Chamber believes that to withdraw such a prospect as the Coastal Plain for only a 2.6 percent addition to wilderness areas is not in the nation's best interests.

Conclusion

The facts are clear. Continued orderly oil and gas development, with appropriate environmental safeguards, is vitally important to the nation's energy and economic future. The discovery and development of the Coastal Plain's potential petroleum resources must be permitted. By the timely and orderly exploration and production of its oil and gas, the U.S. can assure future dependable supplies of energy for its homes, farms, factories, businesses, and transportation and for strengthening its economy, increasing federal revenues, providing jobs, and lowering its balance of trade deficit.

The alternative is to sow the seeds for an energy crisis in the 1990's. In the face of today's lower energy prices, the exploration budgets of oil companies are being slashed drastically, and wells are now being shut in by the thousands in the U.S. Meanwhile, lower prices are encouraging demand. If the U.S. allows these seeds to continue to grow, it will, indeed, have ignored the lessons of the 1970's and will reap a bitter harvest in the 1990's.

national grange

1616 H STREET, N.W. WASHINGTON, D.C. 20006 (202) 628-3507

June 5, 1987

The Honorable J. Bennett Johnston, Chairman
The Honorable James A. McClure, Ranking Minority Member
Senate Committee on Energy and Natural Resources
310 Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senators Johnston and McClure:

On June 2, the Committee on Energy and Natural Resources began holding hearings on the Department of the Interior's proposal to open 1.5 million acres of the Coastal Plain area of the Arctic National Wildlife Reserve (ANWR) in Alaska to oil and natural gas exploration and development. On behalf of our organization's 365,000 members, I would like to express to the Committee our support for the Department of the Interior's ANWR proposal.

The Coastal Plain area of ANWR, which is located near the famous Prudhoe Bay oil fields of northern Alaska, is considered to be the best prospect for finding large amounts of oil on land remaining in the United States. Valuable experience that has been obtained during the exploration and development of the Prudhoe Bay fields has given the U.S. oil industry the technical know how to find and extract petroleum resources in the sensitive environments north of the Arctic Circle without resulting in irreversible ecological damage. Transporting oil from the ANWR Coastal Plain would be economically feasible because of the existence of the TransAlaska pipeline.

National Grange policy supports the reasonable development of this nation's petroleum resources in an environmentally-sound manner. Rural Americans, in general, understand both the benefits and risks inherent in the exploration and development for oil. Energy costs are a large part of both the cost of production on our farms and the cost of living in rural areas. Energy development is a major employer in rural areas, but those same areas have a disproportionate burden of the environmental risks of such development. We understand the concern by some that oil development will damage fragile arctic ecosystems or degrade local economic resources, such as hunting areas for Alaskan native hunters, but after examining the available data on all sides of the issue, we believe that developing the ANWR Coastal Plain will protect our national energy security, our jobs and our environment.

We appreciate this opportunity to express our views on this issue. Please be advised that National Grange policy on ANWR Coastal Plain development is also supported by local Grange policy in Alaska. We would appreciate this letter being made a part of the permanent hearing record.

Sincerely,

Leroy Watson

Leroy Watson
Legislative Representative

LAW/pkh
cc: Senate Committee on Energy and Natural Resources

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	Energy and the Arctic Coast Plain (brochure)
	Environmental Conservation and the Petroleum Industry (study done by the Urban Wildlife Institute)
	U.S. oil and Natural Gas Estimates: Facts and Misconceptions (brochure)
	ANWR Briefing Papers (covers virtually every aspect/topic of the ANWR issue)

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		ANWR Media Briefing Kit
		ANWR: America's Energy Future (a 17:00 video tape)
		ANWR: Decisions for Tomorrow (a 16:48 video tape)
		ANWR Coastal Plain Slide Presentation (20:00 with script)
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4.	Alaska, State of	ANWR Media Briefing Kit
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OIL INDUSTRY CONTACTS

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JACOB ADAMS

PRESIDENT

ARCTIC SLOPE REGIONAL CORPORATION

TESTIMONY
SUBMITTED FOR THE RECORD
ON
THE PROVISIONS OF S. 406
BEFORE
THE SENATE ENERGY AND NATURAL RESOURCES COMMITTEE

March 6, 1989

Mr. Chairman, my name is Jacob Adams. I appreciate this opportunity to submit testimony for the hearing record on S. 406.

I do so in my capacity as President of Arctic Slope Regional Corporation (ASRC). ASRC represents the views and interests of our 3,700 Eskimo shareholders who live in eight remote Villages on Alaska's North Slope.

1. Introduction

The future status of the Coastal Plain of the Arctic National Wildlife Refuge (ANWR) is of critical importance to the nation's long-term economic well-being and to its energy security. The status of the Coastal Plain is also of critical importance to the future well-being of the more than 6,000 Inupiat Eskimo people who are the full-time, year-round residents of Alaska's North Slope.

2. Prior Testimony

Representatives of ASRC testified before this Committee on two occasions in the 100th Congress. I would like to incorporate our prior testimony as Appendices A and B to my statement. ASRC's previous testimony provides important historical background concerning ASRC, our shareholders, the Coastal Plain and our lands at Kaktovik which, in the interest of time, I will not repeat in this statement.

3. ASRC's Interest in the Coastal Plain Decision

The interests of the Inupiut Eskimo people in the Coastal Plain are social, cultural and economic. The pending Congressional decision on the future of the Coastal Plain will determine whether or not my people will have a long-term tax base from which to provide essential and minimal public services. It will also determine whether there will be jobs and economic activity for our young people and our children. Finally, this decision will determine whether we, the people who once held aboriginal title to Prudhoe Bay and all of the North Slope, will be permitted to develop the 92,160 acres of highly prospective private lands that we own at Kaktovik Village.

Let me summarize briefly my people's specific interests in the Coastal Plain.

a. Tax base, public services and local government

Prior to Prudhoe Bay, there was no tax base and no effective means to provide essential public services to the people in our eight remote Villages. In these Villages, sewage service was by "honey pot." Water was hauled by sled from lakes and streams. Our children were sent to BIA schools thousands of miles away. Access to medical care was closed. Fire and police protection were nonexistent. Electrical service was unreliable. Communication with the outside was sporadic. Housing was very poor. The cost of food and essentials was many times that of other areas of the United States.

My people survived by their wits, by barter, by subsistence hunting, and by sharing.

Prudhoe Bay's discovery and subsequent development brought major changes. These changes included, for the first time, a local tax base and an opportunity to establish a local Borough (County) form of government. The "North Slope Borough Government" we established in 1972 has addressed our most important needs for essential public services. For the first time, our Villages are now able to provide our people police, fire, medical and educational services. The Prudhoe Bay industrial tax base made this possible.

b. ASRC and private economic development

Prudhoe Bay's discovery also brought, for the first time, jobs and an opportunity for economic activity to my people. Through ASRC, our regional corporation, and our Village Corporations, my people are part of this activity. We now own small construction, pipeline and oil field service companies which generate profits and provide jobs for our people. Development activities at Prudhoe Bay and other new fields made this possible.

c. Value of our private lands

Finally, Prudhoe Bay's discovery and the construction of the Trans-Alaska Pipeline gave economic value to the mineral estate of our lands and to our land selection rights granted under the Alaska Native Claims Settlement Act. Through lease and business relationships with major energy companies ASRC has generated capital to expand our construction and service companies and to create new jobs.

Unfortunately, the revenue from our lands, to date, has been only from leasing our lands. Thus far, we have no commercial oil or gas production on our land.

d. Uncertain economic future

Obviously, all of these developments have improved my people's quality of life. They have opened new educational, employment and economic opportunities.

But, in major respects, our future is still very uncertain: my people's future is linked to the pending Congressional decision on the Coastal Plain.

If there are no new major discoveries made on the North Slope soon, Prudhoe Bay's production will go into a steep decline throughout the 1990's and will end sometime early in the next century.

In ten to fifteen years, we will see our Borough tax base seriously eroded. This means the minimal services we enjoy today will be cut back.

We will also see job opportunities disappear as North Slope production declines and activities are reduced to a "maintenance" level operation.

Finally, economic opportunities for our Eskimo-owned companies on the North Slope and the economic value of our land will disappear.

That is the future we see if Congress does not open the Nation's best prospect for new "world class" reserves to leasing.

The only bright spot we see is the jobs which will eventually come from dismantling the pipeline and other facilities on the North Slope and shipping them South for scrap iron.

e. Nation's best prospect and need for decision

If, however, Congress decides to open the Coastal Plain to leasing and properly regulated development, we see a much brighter future, for us and for the nation.

No one disputes that the Coastal Plain is the nation's best prospect for major new oil and gas reserves. This does not necessarily mean Prudhoe Bay's discovery will be repeated. It means the potential is there, however, for one or more Prudhoe Bay class reserves.

It also means that continuing the search for needed domestic oil will continue on the North Slope.

And continued exploration is what is necessary. Twenty years after Prudhoe Bay's discovery, what appears to be a major discovery was made a few weeks ago by ARCO and others only a few miles from the Prudhoe Bay reservoir. This shows how little exploration has been done to date, and how much more is needed.

To date, only one exploratory well has been drilled in the Coastal Plain -- our KIC No. 1 well. Yet, the Department of the Interior has identified 26 Prudhoe Bay like structures with four-way closure on the Coastal Plain.

The National Wildlife Federation's "independent" geologist says Interior's projections are too "conservative," because they did not assess reserves in other potential Coastal Plain structures or this area's potential for major new natural gas reserves. The Congressional Office of Technology Assessment concurs in its recent report of last week.

The nation and my people deserve a decision from the Congress in this session. Make this area a "wilderness" or open it to leasing. Delay and indecision serves no useful purpose.

Continuing a policy of "de facto" wilderness -- whether to placate the organized environmental community or to negotiate an elusive national energy policy -- does not serve the public interest.

The need for immediate Congressional action is clear. The cost of imported oil is surging as imports rise to nearly 50 percent of total United States demand.

Companies now willing to commit resources and capital in the Coastal Plain need clear guidelines on when these resources can be usefully employed before this capital is allocated on foreign oil projects.

If my people's economic future is to be limited to guiding a few wealthy individuals who can afford to visit the North Slope and the Coastal Plain by helicopter and charter plane, we need to know that as well.

4. - S. 2214 in the 100th Congress

In the last Congress, ASRC generally supported S. 2214 as reported by the Senate Energy Committee on March 24, 1988. This measure contained strict environmental and regulatory standards to regulate exploratory and developmental activities on the Coastal Plain. The bill also provided stringent protection for the fish and wildlife resources of the area, as well as the

subsistence uses and needs of the Eskimo people who reside at Kaktovik Village.

S. 2214 established a set of policies for guiding the conduct of permitted activities on the Coastal Plain and delegated implementation of these policies to the Secretary of the Interior, subject to Congressional oversight. As reported, the bill built upon the history of successful North Slope oil exploration and development and the impressive gains in technology and regulation which have been made over the twenty years since Prudhoe Bay's discovery.

S. 2214 required that the substantive standards and environmental stipulations contained in the bill be applied to activities associated with the development of the 92,160 acres of private lands within ANWR owned by the Eskimo shareholders of ASRC and Kaktovik Inupiat Corporation (KIC). This requirement is in keeping with the provisions of the 1983 Land Exchange Agreement under which ASRC acquired the subsurface estate beneath the Village Corporation lands at Kaktovik. Unlike the companion House bill, H.R. 3601, however, the Senate bill did not seek to impose statutory limitations on the use of my people's private lands that would constitute an unlawful "taking" of our private property rights.

ASRC and its shareholders commend the Committee for its thorough consideration of this matter in the past Congress. The extensive hearing record, supplemented by field trips and on-site

inspection of the Coastal Plain, laid a thorough foundation for informed judgment and decision-making. My people were pleased that the Committee adopted many of the recommendations and amendments that we advanced in the last Congress for improving S. 2214.

5. S. 406 in the 101st Congress

S. 406, as introduced on February 9, 1989, is virtually identical to S. 2214 except for deletions from the bill made for reasons related to jurisdiction and the "referral" of bills under the Senate Rules. The provisions of S. 2214 deleted from S. 406 are important and have been introduced as amendments to S. 406. In discussing the provisions of S. 406, my statement will address the provisions of these amendments as well.

It is my view that little has changed as a matter of factual and policy considerations since March 24, 1988, when this Committee reported S. 2214. The changes that have occurred, however, are important. They represent trends and events all moving in the same direction. They heighten the urgent need for favorable Congressional action on this legislation.

What are these trends?

a. The nation's domestic crude oil production has continued to decline. This decline will accelerate as Prudhoe Bay production goes into decline. Meanwhile, demand, and oil imports to fill the gap, continue to rise.

b. OPEC is showing new unity. World oil production and prices are being maintained at levels which continue to blunt new conservation efforts and gravely threaten the economic future of many forms of renewable energy and alternative fuels.

c. Those who oppose OCS development continue to expand the areas closed to development.

d. The future of nuclear power continues to appear very uncertain.

e. Today, the nation's future economic well-being is more closely tied than ever before to the use of conventional fuels -- especially crude oil.

The fundamental policy questions for this Committee are, therefore:

- from where will the oil the nation needs now and in the future come?
- how much increased dependence on foreign oil can the nation tolerate? and
- what will the cost of this imported oil be in terms of balance of payments?

The Coastal Plain of ANWR, of course, presents the single most important option available to add major new domestic reserves and production.

This option is available in a time frame which will permit any commercial reserves found in the Coastal Plain to be transported to markets in the lower 48 states. If the Coastal Plain is not opened soon, however, there is an increasing risk that Prudhoe Bay and other reserves will be depleted, and that the Trans-Alaska Pipeline System will eventually be retired and dismantled.

If this happens it is unlikely that Coastal Plain oil could ever be produced. This also means that other small offshore and onshore discoveries on the North Slope may never reach commercial production.

Congress should not enter the decade of the 1990's hiding behind the slogan of: "Drain America Last."

6. S. 406 -- Needed Modifications

a. Impact Aid for Kaktovik Village

One of the recommendations we made last year was that appropriate financial assistance be made available to Kaktovik Village to provide essential infrastructure and services. A decision to open the Coastal Plain will bring greatly increased visitor traffic and other pressures on a Village whose people desire to retain their privacy, their culture and their character as a subsistence Eskimo community.

With advance planning and modest financial aid Kaktovik can play a role in meeting legitimate needs of exploration and development. Kaktovik can provide some of the essential services

and facilities. Attached as Appendix C is an amendment to achieve this objective.

b. Proposed Amendment on KIC's Underselection

Under the provisions of ANCSA and ANILCA, Kaktovik Inupiat Corporation (KIC), the Native Village corporation for the Village of Kaktovik, has a right to receive 92,160 acres of surface estate in the vicinity of the Village of Kaktovik. In accordance with these statutory directives, KIC selected lands that both the Village corporation and the Bureau of Land Management (BLM) thought would be sufficient to fulfill this entitlement. However, because of several Native allotments and submerged lands in the vicinity of the Village, it has now been determined by BLM that KIC cannot fulfill its land entitlement from its existing selections. In fact, BLM estimates that, after the conveyance of all of its pending selections, KIC will still fall approximately 2,400 acres short of fulfilling its 92,160 acre entitlement under ANCSA and ANILCA.

Section 22(j)(2) of ANCSA, as amended by section 1410 of ANILCA, provides a mechanism by which BLM may generally address village corporation underselections. As amended, section 22(j)(2) provides that in cases in which lands selected by a village corporation are insufficient to fulfill the corporation's entitlement under ANCSA, the Secretary is authorized to withdraw twice the amount of the unfulfilled entitlement and provide the village corporation 90 days to select

from the withdrawal the lands necessary to fulfill its entitlement. Thus, section 22(j)(2) provides the mechanism by which KIC could expect to fulfill its ANCSA entitlement.

Nothwithstanding the provisions of section 22(j)(2) of ANCSA, as amended, KIC may have difficulty fulfilling its ANCSA entitlement. In legislation enacted by the Congress last year (Public Law 100-395, August 16, 1988 (102 Stat. 979)), the Congress amended the general exchange authority set forth in section 1302(h) of ANILCA. The amendment prohibited further conveyances of lands within the Coastal Plain of the Arctic National Wildlife Refuge without prior approval by the Congress. Although this legislation was intended to prevent new administrative land exchanges in which the United States would convey to private parties lands within the Coastal Plain, this amendment may be construed to prevent the Secretary from withdrawing and making available for selection by KIC the remainder of its ANCSA entitlement in the vicinity of the Village of Kaktovik. To remedy this problem, ASRC respectfully requests an amendment to S. 406 to clarify the Secretary's authority to convey to KIC lands within the Coastal Plain which may be necessary to complete KIC's ANCSA entitlement. This amendment, enclosed with this testimony in Appendix D, would also ensure that ASRC would receive the subsurface estate beneath the surface estate to be conveyed to KIC in accordance with the terms of the 1983 agreement between ASRC and the United States.

In 1980, the Congress affirmed in sections 1431(g) and 1410 of ANILCA the right of KIC to receive its full 92,160 acre entitlement from lands in the vicinity of the Village of Kaktovik. The proposed amendment would reaffirm this right and assure that the Secretary of the Interior has the administrative authority to make available to KIC these lands to fulfill its entitlement.

In the absence of the proposed amendment, the Secretary may not have the necessary administrative authority to allow KIC to fulfill its entitlement in the vicinity of the Village. In that case, the Congressional intent to allow KIC to fulfill its entitlement may be frustrated, as the Secretary proceeds to lease the lands in the Coastal Plain adjacent to the current lands owned by the Village Corporation. The proposed amendment will avoid this conflict and assure to the Eskimo people the ownership of those lands that were promised to them by the Congress in ANCSA and ANILCA.

7. Major Oil Company Amendment to Take Eskimo Property Rights

In recent weeks, several major oil companies have made a major legislative effort in the Senate Energy Committee to secure adoption of an amendment to S. 406 which we believe would be an unlawful taking of the contractual and property rights of ASRC and its shareholders. This amendment would prevent ASRC and its lease holders from engaging in exploratory drilling on the

subsurface estate owned by ASRC in the Coastal Plain at the date of enactment of ANWR legislation. Instead, such activity could not occur until the first lease sale is held by the Secretary in the Coastal Plain.

As background, ASRC received the rights to 92,160 acres of subsurface in and adjacent to the Coastal Plain in an August 9, 1983 land exchange with the United States. Approximately 69,000 acres of this subsurface estate is not in the Coastal Plain, and ASRC was free, from the date of the receipt of this land, to engage in exploratory drilling on this land. However, approximately 23,000 acres of ASRC's subsurface estate is within the Coastal Plain as that term was defined in section 1002 of ANILCA. On this 23,000 acre parcel, ASRC agreed to refrain from exploratory drilling until the date of enactment of legislation opening either the Coastal Plain of ANWR or the ASRC lands to oil and gas exploration or development. Once Congress acts to open the Coastal Plain of ANWR to oil and gas exploration or development, ASRC has an unfettered right to engage in exploratory drilling on this 23,000 acres of land (known as "the fourth township"). Enclosed for the information of the Committee as Appendix E is a February 28, 1989 memorandum that describes in more detail ASRC's rights to engage in exploratory drilling on the fourth township.

Several major oil companies have proposed an amendment to preclude ASRC from engaging in exploratory drilling on this

fourth township of land until the first lease sale. Two arguments have been advanced by these major oil companies for this amendment.

First, the major oil companies have alleged that, as a matter of environmental protection, ASRC should refrain from exploratory drilling on the fourth township until the promulgation of environmental regulations by the Secretary of the Interior to assure that such exploratory drilling does not occur in a manner harmful to the environment of ANWR. However, this argument fails to recognize that, as a part of the 1983 land exchange agreement between ASRC and the United States, ASRC, its successors, and assigns are bound by an extensive set of very strict environmental land use stipulations to assure that any exploratory drilling by ASRC or its oil company partners within ANWR are conducted in the most environmentally sound manner possible. In addition, the environmental stipulations provide that ASRC will also be bound by the provisions of any additional environmental protections established by the Congress in legislation to open ANWR and by further regulatory restrictions deemed necessary by the Secretary of the Interior. Thus, any drilling conducted by ASRC on either its 69,000 acres adjacent to the Coastal Plain or the fourth township within the Coastal Plain will be conducted in the most environmentally sound manner possible.

The second argument advanced by the proponents of this amendment is that, if ASRC and its partners are permitted to drill an exploratory well on the fourth township prior to the first ANWR lease sale, the United States will receive less revenue as a result of bonus bids in the first lease sale. Once again, there is no basis for this allegation. Indeed, evidence from recent lease sales demonstrates just the opposite conclusion.

In many instances in which the Federal government leases Federal lands, both onshore and offshore, adjacent lands have previously been leased or are in private ownership. Often, exploration wells have been drilled on these lands adjacent to unleased Federal acreage. History demonstrates that when a Federal lease sale is held on acreage adjacent to an area that has been drilled by an oil company or a group of oil companies, speculative interest is heightened and Federal revenues are enhanced.

Indeed, logic dictates this result. If an exploratory well is drilled on acreage adjacent to the Federal acreage to be leased and oil is discovered, it may be anticipated that the companies with such information will bid more than other companies without such information. On the other hand, if a well is drilled and no oil is discovered, companies with this information may be expected to refrain from bidding on adjacent tracts, but companies without such information may be expected to

bid an equivalent amount to what they would have bid in the absence of the drilling of this exploratory well. Thus, the drilling of a well on adjacent property prior to a lease sale is unlikely to reduce Federal revenues, but may substantially enhance the revenues that the Federal government may receive in such a lease sale.

As we have tried to discuss this matter with the members of this Committee and their staffs, we have recognized that a small group of North Slope Eskimos in Barrow, Alaska, cannot have near the lobbying impact of twenty of the nation's largest oil companies, operating in a coordinated manner on what is viewed by most Members of Congress as a "minor" legislative amendment. For us, the amendment is <u>not</u> minor; it is, instead, our children's future; our best hope to participate in the economic benefits of our privately owned land and resources.

We respectfully request, therefore, that each of the proponents of the Taking Amendment be asked to respond, on the public record, to one question. The question is this: "If the legislative language we Eskimos call the "Taking Amendment" (referred to in the House Merchant Marine Committee as the "Weldon Amendment") is good public policy and good energy policy for our private lands in the small Coastal Plain of Alaska, why shouldn't this policy be enlarged and made national policy for <u>all</u> lease sales on the Outer Continental Shelf and the onshore public lands of the United States?"

I am enclosing as Appendix F a more detailed explanation of this concept. If the oil companies that now ardently advocate the adoption of the Taking Amendment cannot support the amendment as national law applicable to all Federal lease sales, then I believe that there is obviously something fundamentally wrong and unfair about the amendment.

It should also be fully recognized that in 1984 ASRC invited the 19 major oil companies active on the North Slope of Alaska to present bids or offers for leases on our Kaktovik lands. Six offers were received from different combinations of these companies. ASRC ultimately selected the high bid offer of Chevron and BP. The point of this history is that this is a very competitive industry. The companies now pushing the Taking Amendment had every opportunity in 1984 to acquire leasehold interests in our Kaktovik property. To reward their failure to be competitive and take risks at this late date is contrary to the competitive ethic, to free enterprise and to the historic traditions of the oil industry.

We believe that the proposed amendment is bad public policy and would result in an unfair taking of our private property rights. It has been suggested that this amendment will ensure a "level playing field" for all participants in the first lease sale in ANWR. At the same time, several of the proponents of this amendment are participating in exploratory wells in the Federal and State offshore areas directly adjacent to the Coastal

Plain of ANWR and the ASRC lands. By preventing ASRC and its partners from engaging in exploratory drilling on ASRC's private lands while engaging in exactly these activities on adjacent offshore leases, these companies are in fact heavily tilting the playing field in their favor. In addition, these companies are ensuring that they need bid the least amount of dollars possible in the first ANWR lease sale, thus reducing rather than increasing the anticipated revenues that the United States may expect as a result of the action to open ANWR to oil and gas leasing.

8. Section 7(i) Amendment

ASRC acquired the rights to its 92,160 acres of subsurface estate in ANWR in a 1983 land exchange with the United States. ASRC acquired its subsurface estate by exchanging to the United States over 101,000 acres of prime wilderness surface estate in the heart of the Gates of the Arctic National Park. Because ASRC exchanged only surface estate to the United States in acquiring the Kaktovik subsurface, ASRC has consistently maintained since 1983 that any revenues that it derives from this subsurface estate are not subject to the revenue sharing requirements of section 7(i) of the Alaska Native Claims Settlement Act of 1971 (ANCSA).

Section 7(i) of ANCSA provides that Alaska Native Regional Corporation must share with the other eleven Regional Corporations revenues derived from subsurface or timber resources

received pursuant to ANCSA. Following its passage as a part of the Native land claims settlement enacted by Congress in 1971, this provision engendered ten years of divisive litigation among the twelve Regional Corporations in an attempt to define the parameters of this seemingly straightforward concept.

In 1982, the twelve Regional Corporations finally agreed on a 120-page "Section 7(i) Settlement Agreement." This Settlement Agreement sets forth detailed ground rules for applying the broad dictates of section 7(i) to specific factual situations. It also establishes binding arbitration as the exclusive mechanism for settling disputes arising under section 7(i) on the Settlement Agreement.

The Settlement Agreement also establishes specific rules with respect to land exchanges. One of these rules, on which ASRC relied in executing the 1983 land exchange, provides that, when a Regional Corporation exchanges only surface estate in a land exchange, the property that the Regional Corporation receives is not subject to the revenue sharing requirements of section 7(i) even if this property consists, in whole or in part, of subsurface estate.

Having parted with our most valuable surface estate (land that was actively sought for public ownership by the National Park Service for many years) to acquire the Kaktovik subsurface estate, we now believe that the revenues that ASRC has and will receive from this subsurface estate are exempt from the sharing

requirements of section 7(i) of ANCSA as interpreted by the Settlement Agreement agreed to by all twelve Regional Corporations in 1982. ASRC believes that the law on this matter is clear and that Congressional intervention is this inter-Regional Corporation dispute is unnecessary and inappropriate as a matter of policy and improper as a matter of law.

It is our understanding that representatives of six Alaska Native Regional Corporations have been engaged in a lobbying effort seeking Congressional action on an amendment that would threaten my people's economic future. This amendment would prevent development of our lands at Kaktovik unless ASRC agrees to give nearly 70 percent of the revenues received from these lands to the eleven other Regional Corporations in Alaska. This amendment is proposed for addition to S. 406. The proposed amendment, if adopted, would require ASRC's Eskimo shareholders:

1) to agree to give nearly 70 percent of the economic value of our most valuable asset -- our 92,160 acres of private lands in the Coastal Plain and in ANWR -- to the eleven other regional corporations; or

2) if ASRC's shareholders do not agree to make this gift, the amendment would forever deny my people the opportunity to develop their private lands at Kaktovik in violation of ASRC's 1983 land exchange contract with the United States Government.

The proponents of this amendment allege that what they are asking for is required by section 7(i) of ANCSA and the 1982 Settlement Agreement among all twelve Regional Corporations. Yet, they have totally disregarded the dispute resolution machinery that all of the Corporations agreed to when we signed that contract. In fact, the very arguments that they are making to Members of Congress are simultaneously being made by three of the proponents of the amendment to an arbitration panel in Seattle. The parties have expended literally millions of dollars over the last three years to answer the legal questions that the proponents now ask you to assume away. Final arguments in the artibration were held on February 28, 1989. A final decision is expected from the arbitration panel within thirty to sixty days. If the claimants in that arbitration prevail, the legal questions that the proponents have raised will be answered in their favor and Congressional intervention will be unnecessary. If they fail, ASRC will have established its rights under the 1982 contract among the Regional Corporations -- rights that cannot be taken away from ASRC without just compensation.

The advocates of this amendment have apparently concluded that the case they have presented in the arbitration proceedings lacks merit and has little chance of success. They are, therefore, now asking Congress to legislate a result that they now believe they cannot achieve in the exclusive legal forum all of the corporations agreed upon in 1982 for resolving section 7(i) issues and claims.

The amendment proposed by these six Regional Corporations is unprecedented. If enacted, it would constitute a legislative taking of nearly 70 percent of my people's Kaktovik property. If enacted, it would also expose the United States government to very substantial liability for an unconstitutional taking of the North Slope Eskimos' single most valuable property right.

On behalf of the Inupiat Eskimo people, I respectfully request that the Senate Energy Committee permit the arbitration panel to proceed to a judgment, based on the facts and the law as presented in the record of the proceedings, without legislative interference.

CONCLUSION

Mr. Chairman, my people appreciate the opportunity to present our views. The future of the Coastal Plain is of critical importance to our future and our children's future. We recognize that our interests sometimes get lost in debates involving national energy policy, balance of payments, the budget deficit and other fundamental issues of government policy.

We strongly urge the Committee to open the Coastal Plain to a carefully regulated, environmentally sensitive program of leasing, exploration and development.

Appendix A

OLIVER LEAVITT
VICE PRESIDENT
ARCTIC SLOPE REGIONAL CORPORATION

DEPARTMENT OF THE INTERIOR'S REPORT:
"ARCTIC NATIONAL WILDLIFE REFUGE:
COASTAL PLAIN RESOURCE ASSESSMENT AND
LEGISLATIVE ENVIRONMENTAL IMPACT STATEMENT"

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June 4, 1987
Senate Energy and Natural Resources Committee

1. Introduction

My name is Oliver Leavitt. I am an Inupiat Eskimo from Barrow, Alaska. I appreciate the opportunity to appear before this Committee on the Department of the Interior's Section 1002(h) Report on the future status of the 1.5 million acre Coastal Plain of the Arctic National Wildlife Refuge (ANWR).

By way of background, I serve as an elected Assemblyman for the North Slope Borough government. I am also a Member of the Arctic Research Commission. This Commission makes recommendations to the Congress and to the President on Arctic research priorities and objectives.

I appear today in my capacity as Vice President and a member of the Board of Directors of Arctic Slope Regional Corporation (ASRC). Our President, Mr. Jacob Adams has asked me to convey his regrets that an illness in his family prevents his appearance today.

ASRC is one of twelve regional Native corporations in Alaska. ASRC has 3,700 Eskimo shareholders living in eight Villages on the North Slope. Our Villages are located near the Canadian border in the east, near the Soviet Union in the west and in the Central Arctic. Kaktovik Village is located on Barter Island. The Kaktovik Inupiat Corporation (KIC), the village corporation for Kaktovik, owns 92,000 acres of surface lands within the boundaries of ANWR and adjacent to and partially within the Coastal Plain. ASRC owns the subsurface estate in these lands.

2. Background

ASRC and our Village Corporations were created pursuant to the Alaska Native Claims Settlement Act of 1971 (ANCSA). Enactment of ANCSA extinguished the Inupiat Eskimo people's "aboriginal title" to virtually all of the 56 million acres of land on Alaska's North Slope.

In compensation, the Inupiat Eskimo people were granted the right to select approximately 5 million acres of land on the North Slope and received a cash settlement to be paid over eleven years from Federal appropriations and State mineral revenues. Our right to select our land entitlement was, however, extremely limited. The best North Slope lands were not available to ASRC and its shareholders. The best lands had previously been leased to oil companies or selected by the State of Alaska. Other North Slope lands were set aside by the

Federal government for Wildlife Refuges such as ANWR, for military purposes such as the Naval Petroleum Reserve-Alaska, or placed in some other restricted status which limited or made them totally unavailable for selection by the Eskimo people.

In return for this settlement -- which was a necessary condition before commercial oil development could proceed after the 1969 discovery of Prudhoe Bay on the North Slope -- our claim of legal title to the oil fields at Prudhoe Bay, at Kuparuk, at Milne Point and in other areas was extinguished. These oil fields now produce almost 2 million barrels per day (B/D) of crude oil -- more than 20 percent of the Nation's total production. In 1985 alone, these fields produced crude oil worth in excess of $16 billion.

3. Subsistence Use of the North Slope's Resources

Like many of my relatives, friends and people, I am a subsistence hunter. The North Slope of Alaska is Inupiat land. As the land's subsistence users, my people are also the land's historic stewards and the guardians of its wildlife.

The Eskimo people of my generation have had to learn to live in two worlds. We have learned to speak English while, at the same time, we have tried to preserve our Inupiat language. We have accepted appropriate technology, but we remain subsistence hunters. We now have a cash economy, but we still live by the tradition of "sharing" which is the Inupiat Eskimo way.

Much of our life today is tied up in corporate activities, in managing our lands, in dealing with the State and Federal governments, and in trying to make a living in the cash economy (which is now deeply depressed) that North Slope oil production brought to the Eskimo people.

We have seen many changes. Some are welcome, some are not. Above all, we still try to live by our traditions, to maintain our culture and to teach our children respect for the traditional way and for themselves.

4. ASRC's Shareholders Interests in the Coastal Plain

As the historic residents of the North Slope and the Coastal Plain, and as private property owners, our shareholders have important interests in the Secretary of the Interior's recommendations and in the decisions of the Congress on the future status of the Coastal Plain:

- The Village of Kaktovik, with 210 Eskimo residents, is located within ANWR adjacent to the Coastal Plain;
- The people of Kaktovik are dependent on the caribou, on sea mammals and on the fish and wildlife resources of the Coastal Plain for their subsistence;
- ASRC and KIC are the owners of fee title to 92,000 acres of lands located within ANWR and within and adjacent to the Coastal Plain area; and

- Our Kaktovik private lands are highly prospective for major oil and gas discoveries and represent my people's best prospect to participate in the economic development of our ancestral lands.

Our interests in the Coastal Plain and our views are set forth in a report prepared by an ASRC subsidiary and issued in June of 1986. This report is entitled The Arctic National Wildlife Refuge: Its People, Wildlife Resources, and Oil and Gas Potential. I ask that a copy of the report be made a part of the record of these hearings.

This report is factual and objective in assessing the human, wildlife, economic and national security values the Congress should consider in acting on the recommendations of the Secretary of the Interior and in making decisions about the future use and management of the Coastal Plain. ASRC's views on policy issues are summarized in the Preface to the report by Mr. Jacob Adams, ASRC's President.

5. Arctic Slope Regional Corporation's Ownership of Kaktovik Subsurface Lands

On December 18, 1971, the Alaska Native Claims Settlement Act as enacted by Congress became law. ANCSA extinguished the aboriginal title and land claims of the Alaska Native people to most of Alaska and directed the conveyance of 44 million acres of land to Alaska Native corporations and cash payments in settlement.

The Native people of the Village of Kaktovik, located on Barter Island and within ANWR, established the Kaktovik Inupiat Corporation in 1972. Under ANCSA, KIC was granted the right to select 92,160 acres of surface estate. However, KIC was limited to selecting no more than 69,120 acres (3 townships) in the vicinity of the Village and was required to select the remaining 23,040 acres (one township) of its entitlement outside of ANWR because of an ANCSA provision (Section 12(a)(1)) limiting village land selections within units of the National Wildlife Refuge System to 3 townships or 69,120 acres.

Under ANCSA, ASRC was granted the right to select approximately 5 million acres of land on Alaska's North Slope. ASRC was, however, precluded from selecting lands within ANWR or the Naval Petroleum Reserve No. 4 (later redesignated National Petroleum Reserve - Alaska (NPRA)). Under ANCSA, regional corporations generally received the subsurface estate beneath the surface lands selected by each region's Village corporations. However, ANCSA prohibited ASRC from receiving title to the subsurface estate beneath those Villages which were located within ANWR and NPRA.

On June 29, 1979, ASRC and Secretary of the Interior Cecil Andrus executed a major land exchange and consolidation agreement, settling many outstanding conflicts between ASRC and the Department of the Interior arising under ANCSA. Included

in the agreement are provisions that, subject to later Congressional approval, would: (1) permit KIC to exchange the 23,040 acres of surface lands selected outside of ANWR for an equivalent acreage to be selected adjacent to the existing 69,120 acres already selected by KIC near the Village of Kaktovik; and (2) grant an option to ASRC to exchange "in lieu" subsurface lands selected outside of ANWR and NPRA for the subsurface estate beneath the appropriate Village lands in those reserves if and when either reserve is later opened to oil and gas development.

The KIC exchange would permit the consolidation of the isolated acreage outside of ANWR with the lands already selected by KIC in the vicinity of the Village. The option to ASRC would permit the consolidation of the surface and subsurface estates in Native ownership, thereby assuring Native control of any development of the subsurface beneath Village-owned surface estate.

On December 2, 1980, Congress enacted the Alaska National Interests Lands Conservation Act (ANILCA). Section 1431 of ANILCA approved and ratified, as a matter of federal law, the June 29, 1979 agreement between ASRC and the Department of the Interior. Section 1431(g) of ANILCA allowed KIC to exchange the isolated acreage outside of ANWR for an equivalent acreage in the vicinity of the Kaktovik Village. Section 1431(o) of ANILCA granted ASRC the option to exchange "in lieu" subsurface

lands outside of ANWR for subsurface lands beneath KIC surface estate if Congress opens ANWR to oil and gas development.

On August 9, 1983, pursuant to administrative exchange authority set forth in Section 1302(h) of ANILCA, ASRC and the Secretary of the Interior executed a land exchange agreement whereby ASRC conveyed 101,000 acres of surface estate at and near Chandler Lake in Gates of the Arctic National Park to the United States. As its part of the exchange, the United States agreed to convey to ASRC approximately 92,000 acres of subsurface estate beneath the surface estate owned by KIC. In approving this land exchange, the United States recognized that it could receive, in exchange for the KIC subsurface lands, valuable inholdings in Gates of the Arctic National Park at the time of the exchange. The alternative to the Department would have been to wait until the "coastal plain" of ANWR is opened to oil and gas development, at which point it would receive much less valuable "in lieu" subsurface lands from ASRC in exchange for the KIC subsurface lands. By executing the exchange in 1983, the United States was assured of receiving valuable National Park System inholdings for the KIC subsurface.

Attached to my statement is a chronology on the Kaktovik exchange for the information of the Committee.

6. ASRC's Policy Recommendations

The primary purpose of my testimony today is to convey, on behalf of ASRC's 3,700 shareholders, our view that the Secretary, the Administration, the Congress and the American people should join to accomplish two important goals:

First, in all fairness, permit the Eskimo people the right to explore and develop the oil and gas potential of our 92,000 acres of privately-owned lands within ANWR and within and adjacent to the Coastal Plain.

Second, as a matter of national policy, permit exploration and development of the potentially vast oil and gas resources of the Coastal Plain of ANWR, subject, of course to prudent regulations to protect the environment, the interests of subsistence users, and the fish and wildlife values in this area.

For my people, our lands in and near the Coastal Plain represent our best, and perhaps our last chance to participate directly, as owners, in the economic benefits that North Slope oil development has brought to our State and to the Nation.

The Eskimo people have more at stake in decisions about development on the North Slope than any other group of people in the Nation. As a result, we are careful students -- and at times have been strong critics -- of developmental activities proposed for the North Slope by both government and by industry. We have taken our views on these matters to the

Courts, to the State Legislature, to the Congress and to the negotiating table.

The Inupiat Eskimo people do not, however, oppose development of oil and gas resources on the North Slope as a matter of principle or philosophy.

We oppose development where it can't be done properly and and in a manner compatible with our fish and wildlife resources and our subsistence life style.

We favor development if it benefits our people and our nation and if it can be done in a manner that is compatible with our long-term interests as subsistence users in protecting the environment and the fish and wildlife values of the North Slope.

We strongly support opening the Coastal Plain to properly regulated and controlled exploration, development and production.

7. The Prudhoe Bay Operating Experience

My people have watched North Slope oil development very carefully over the past twenty years. Years ago, we were apprehensive. But we have seen very impressive gains made in planning, in technology and in project execution over the years.

Prudhoe Bay's record -- in spite of our initial doubts and concerns -- is a very good one. The Kuparuk oil field development record is better. We are convinced that the next

major energy development project on the North Slope can be and will be even better. This is because industry is making real gains in planning, in technology and in operating knowledge in the Arctic environment.

As a result, we believe that energy production facilities can be developed and operated in the Coastal Plain in a manner that is compatible with the very important fish, waterfowl and wildlife species of the Coastal Plain. This will, however, require careful regulation and it will cost money. But it can be done and it should be done.

8. The National Interest

While it is true that the Eskimo people have direct economic interests as well as cultural, subsistence and other traditional interests in the decision to open the Coastal Plain, our interests do not stop there.

As Americans, we believe there are larger and more important issues and values at stake here. The tragedy of the U.S.S. Stark incident in the Persian Gulf underlines the fundamentally important issues presented, the human values at stake, and the suddenness with which assumptions about the economic security of oil import dependance can change.

The producing nations of the Middle East possess substantial market power in determining the world price of crude oil through their control of its supply. They exercised this power in October of 1973 and again in 1978 to greatly

increase oil prices. They exercised this power once again in December of 1985 to significantly reduce oil prices. The actions of the producing nations were taken to enlarge their market share by forcing higher cost energy production in the U.S. and other nations to be shut in, and to reverse worldwide gains made in energy conservation and alternative fuels technology over the past thirteen years.

The OPEC member countries' recent use of their awesome power over world oil supply to control the price of the world's most important energy resource raises grave and fundamental policy questions for our Nation and for all Americans.

To maintain an acceptable degree of energy independence, the nation must explore and develop our best prospects on the public lands for major new "Middle East class" discoveries of "Prudhoe Bay" and "Kuparuk" dimensions. And, without question, the nation's best prospect for major new discoveries is the Coastal Plain of ANWR.

9. <u>The Caribou Concern</u>

Later today the Committee will hear the testimony of representatives of some interior Athabascan Indian Villages. The people of these Villages take caribou from the Porcupine Herd during the fall migration. They will express concerns about the potential impact of Coastal Plain oil and gas development on the caribou.

I do not agree, and the vast majority of the Eskimo people on Alaska's North Slope do not agree, with the positions they will advocate for the future of the Coastal Plain. We understand their concerns, however, and their fear of the unknown.

We were in their position in the late 1960's and 1970's. We heard and read the claims being made then that caribou would not cross the pipeline; that development of oil wells would disrupt calving; that there would be oil spills and massive pollution. At that time, we were concerned and we had fear of the unknown. And we voiced many of our concerns as these Athabascan Indians will do later today.

The Eskimo people ask that you hear these people's concerns, with sympathy and understanding. We also ask that you recognize that our fears of the 1960's and 1970's were proven groundless. The caribou in the Prudhoe Bay area have not declined; instead they have steadily grown in number. Other wildlife species did not suffer either. Those who predicted environmental disaster were proven wrong by the operating experience at Prudhoe Bay.

Yet, today, we hear the same claims, the same alarms, as if they were written by the same hand and pen; they produce the same uncertainty and fear in the Athabascan people that my people from the North Slope experienced many years ago.

When you, as Members of this Committee, make policy decisions to govern the future of the Coastal Plain, we ask you to look to facts, experience and history as the basis for your actions. Do not look to a fear of the unknown incited by charges long ago proven erroneous as a basis for public policy. Look, instead, to what is now happening in the Persian Gulf. Look at what OPEC power over production and price have done to our domestic energy industry. Look at the facts on declining domestic resources and production. Look at rising and dangerous import levels. Look at the balance of payments account for imported oil. Look at the lack of OCS development in our frontier areas.

On behalf of the Inupiat Eskimo people, I want to make a number of additional points for the record on the Department of the Interior's Coastal Plain Report and the Secretary's recommendations.

First, the Secretary of the Interior's recommendations for the future status of the Coastal Plain are proper and appropriate, they are based upon a factual record of successful operating experience, and they serve the national interest. We have minor differences with a number of the subjects contained in the report and we will submit detailed comments for the record.

Second, this Committee will hear, in the days ahead, conflicting testimony on the biological aspects of this report

and on permitting exploration and development on the Coastal Plain.

I submit that the best experts on the impact of oil exploration and development on the North Slope, on the caribou, and on the fish and wildlife resources of the Coastal Plain are the Eskimo people. We have managed a subsistence living on these resources since time immemorial. We have endured the cycles of plenty and the cycles of scarcity for thousands of years. The Eskimo people will live on the Slope after the oil is gone; after the media has moved on to other issues; after the political interest has waned; and after the national environmental organizations have moved on to other issues to feature in their fund raising efforts, their membership drives and in their publications.

Third, over the past twenty-five years the Eskimos have seen major changes in our life style. In recent years we have, for the first time in history, been able to afford schools in our villages, jobs for our people, good quality housing, power plants to provide electricity, health services, fire protection, and, in some of our larger Villages, running water and sewer systems. These benefits -- which most Americans take for granted -- were made available only because North Slope oil development provided a tax base for our Borough government, and because economic activity led to contracts for ASRC and its subsidiaries and meaningful jobs for our shareholders.

Fourth, ASRC supports appropriate revenue sharing or impact aid for the North Slope Borough, for the Village of Kaktovik, and for other units of government impacted by development of ANWR's oil and gas resources.

Conclusion

In 1980 Congress, largely under the leadership of Senator Henry M. Jackson and many of the Members of this Committee, refused to designate the Coastal Plain as Wilderness. Instead, Congress designated the public lands of the Coastal Plain a special study area and requested a detailed five-year study to determine whether oil exploration could be conducted compatibly with the needs and interests of the Eskimo subsistence users and the fish and wildlife resources of the area.

The Department of the Interior's report and twenty years of North Slope operating experience answer these questions conclusively. The issues remaining involve policy and politics, and choices about hov to advance the national interest and our national security.

There is no question that the best onshore prospect in the United States today is the 1.5 million acre Coastal Plain of ANWR. Even the National Wildlife Federation's expert geological consultant has found that the Federal and State projections of the Coastal Plain's huge oil and gas resource potential are too conservative.

Further, there is no real dispute that the Coastal Plain can be developed in a manner which is compatible with the area's important fish, waterfowl and wildlife resources.

Finally, there is a very real national need for the nation to get serious about energy policy:

-- the million barrel a day loss in domestic production in 1986 must be stopped;

-- the sharp upward trend in oil imports dependency on OPEC and the Persian Gulf must be brought under control; and

-- the gains made over the past 15 years in energy conservation and alternative energy must be restored and maintained.

The place to begin, and the issue on which to show the world our national resolve, is by opening the Coastal Plain to properly regulated oil and gas development.

Thank you.

June 3, 1987

CHRONOLOGY
ARCTIC SLOPE REGIONAL CORPORATION'S
OWNERSHIP OF KAKTOVIK SUBSURFACE ESTATE
SELECTED DATES AND EVENTS
1971-1987

1971

December 18 — Congress enacts and President Nixon signs Alaska Native Claims Settlement Act (Pub. L. 92-203) ("ANCSA") into law. Kaktovik Inupiat Corporation ("KIC"), the village corporation for the Native village of Kaktovik, is granted the right to select 92,160 acres (four townships) of surface lands. Of this total land grant, however, only 69,120 acres (three townships) can be selected within the area withdrawn near the village. KIC must select the remaining 23,040 acres (one township) of its ANCSA entitlement outside of the Arctic National Wildlife Refuge ("ANWR"), the area where the Village is located, because of the ANCSA provision (Section 12(a)(1)) limiting village land selections within a unit of the National Wildlife Refuge System to no more than three townships.

Arctic Slope Regional Corporation ("ASRC"), the regional corporation for the Native residents of Alaska's North Slope, is granted by ANCSA the right to select approximately 5 million acres of surface and subsurface estate. ASRC is, however, precluded from selecting lands within ANWR, within the Naval Petroleum Reserve No. 4 (later redesignated National Petroleum Reserve - Alaska ("NPRA")) or within areas previously selected by the State of Alaska. Although regional corporations are, under ANCSA, generally conveyed the subsurface estate beneath their village corporation's surface lands, ANCSA does not allow ASRC to receive title to subsurface beneath village lands, such as Kaktovik, which are located within ANWR and NPRA.

ANCSA also confirms the State of Alaska's selections in the Prudhoe Bay area despite the aboriginal claims of the Eskimo people to these lands.

1972

March 15 — Secretary of the Interior Morton withdraws approximately 12 million acres of the North Slope's 56 million acres. The lands withdrawn are outside NPRA, ANWR and State selection areas. ASRC is allowed to select its 5 million acre entitlement only from these withdrawn lands. Among lands withdrawn for ASRC selection are those surrounding Chandler Lake, the most spectacular large mountain lake in the central Brooks Range.

1974

January — KIC selects its 69,120 acre entitlement near Kaktovik Village.

November 6 — ASRC makes a portion of its ANCSA land selections, including the Chandler Lake area selection.

December 3 — KIC selects 23,040 acres outside ANWR's boundary about 85 miles southwest of Kaktovik Village. This completes KIC's 4 township (92,160 acres) entitlement.

1976

November 29 — Bureau of Land Management ("BLM") conveys Chandler Lake area to ASRC. ANCSA Interim Conveyance No. 048.

1977

January 14 — BLM issues interim conveyance and patent to KIC of surface estate selected near Kaktovik Village. ANCSA Interim Conveyance No. 052 and Patent No. 50-77-0046.

1978

March 28 — BLM conveys 22,812 acres of surface estate to KIC of the 23,040 selection outside of ANWR (228 acres held back for survey purposes). ANCSA Interim Conveyance No. 085. ASRC receives conveyance of the subsurface estate. ANCSA Interim Conveyance No. 086.

1979

June 29 — ASRC and Secretary of the Interior Cecil Andrus sign major land exchange and consolidation agreement. Included in that agreement are provisions that, subject to

later congressional approval, would:
(1) permit KIC to exchange the 23,040 acres of surface estate selected outside of ANWR for an equivalent acreage of surface estate to be selected from lands contiguous, compact and adjacent to the 69,120 acres already selected near Kaktovik Village; and (2) grant ASRC the option to exchange "in lieu" subsurface lands selected outside of ANWR and NPRA for the subsurface estate beneath the appropriate village lands in the reserves if and when either of the two federal reserves (ANWR and NPRA) are later opened to commercial oil and gas development. The purpose of the KIC exchange is to allow consolidation of isolated and unused acreage outside of ANWR with those lands previously selected near and adjacent to Kaktovik Village. The purpose of the ASRC option is to consolidate surface and subsurface estates in Native ownership, thereby assuring Native decision-making about and control of any private development of the subsurface estate beneath village-owned surface lands.

1980

December 2 Congress enacts Alaska National Interest Lands Conservation Act (Pub. L. 96-487) ("ANILCA"). Section 1431 of ANILCA approves and ratifies, as a matter of federal law, the June 29, 1979 agreement between ASRC and the Department of the Interior. Section 1431(g) of ANILCA allows KIC to make the 23,040 acre land exchange to join that acreage with its original 69,120 acre selection near the Kaktovik Village. Section 1431(o) of ANILCA grants ASRC the option to exchange any of its "in lieu" subsurface lands outside of ANWR and NPRA for subsurface beneath appropriate village lands if and when Congress opens either reserve to oil and gas development.

Section 201 of ANILCA also establishes the Gates of the Arctic National Park in the central Brooks Range. Included within the new park boundaries are the Chandler Lake lands conveyed to ASRC three years earlier.

December 12 — In the 1981 Department of the Interior Appropriations Bill (Pub. L. 96-514), Congress acts to open NPRA to oil and gas leasing, thereby triggering ASRC's rights under Section 1431(o) of ANILCA to acquire subsurface lands beneath the three villages located in NPRA.

1983

August 9 — Pursuant to administrative exchange authority set forth in Section 1302(h) of ANILCA, ASRC and the Department of the Interior execute a land exchange agreement whereby ASRC conveys 101,000 acres of surface lands at and near Chandler Lake in the Gates of the Arctic National Park to the United States. As its part of the exchange, the United States conveys to ASCR approximately 66,000 acres of federally-owned subsurface beneath Kaktovik Village surface lands owned by KIC, and agrees to convey to ASRC the remaining 26,000 acres of subsurface (for a total of 92,000 acres) when KIC selects and receives title to its remaining surface entitlement. Exploration

activities, including exploratory drilling outside of ANWR Section 1002 "coastal plain," on ASRC/KIC land are made subject to stringent environmental stipulations included in 1983 exchange agreement.

1984

February 6 — ASRC enters into an agreement with Chevron, Standard (then Sohio) and British Petroleum for exploration of the Kaktovik subsurface lands. Exploratory drilling contemplated on Kaktovik subsurface outside ANWR Section 1002 "coastal plain," but no exploratory drilling allowed on Kaktovik subsurface inside "coastal plain." If Congress later acts to remove prohibition on oil and gas development within ANWR (Section 1003 of ANILCA), the agreement provides for development and production of oil and gas from these lands.

July 17 — Congress enacts Barrow Gas Field Transfer Act (Pub. L. 98-366). Section 5(d) of the Transfer Act deems the Kaktovik subsurface lands conveyed, or to be conveyed, to ASRC pursuant to the August 9, 1983 land

exchange agreement as being conveyed and received pursuant to ANCSA land exchange authority.

1986

July 25 — Bureau of Land Management issues an administrative decision authorizing conveyance to KIC of most of its remaining land entitlement. 51 Fed. Reg. 23159 (June 25, 1986).

August 8 — BLM conveys 17,806 acres of surface lands to KIC. ANCSA Interim Conveyance No. 1209. ASRC receives conveyance to equivalent subsurface (pursuant to 1983 exchange agreement). ANCSA Interim Conveyance No. 1210.

November 7 — BLM conveys 1,782 acres of surface land to KIC. ANCSA Interim Conveyance No. 1291. ASRC receives conveyance to equivalent subsurface (pursuant to 1983 exchange agreement). ANCSA Interim Conveyance No. 1292. The bed of the Jago River is excluded from these conveyances as State of Alaska has asserted ownership to river bed

under the Statehood Act and the Submerged Lands Act. Balance of conveyance held up pending resolution of State's claim.

1987

March 23 Department of the Interior transmits to Federal Co-Chairman, Alaska Land Use Council, a memorandum entitled "Consultation With State of Alaska in August 9, 1983, Chandler Lake-Kaktovik Land Exchange." Memorandum provides details on chronology of exchange, legal authority, public interests served and consultation and review. Copy attached.

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Appendix B

October 14, 1987

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TESTIMONY
OF
OLIVER LEAVITT
VICE PRESIDENT
ARCTIC SLOPE REGIONAL CORPORATION

October 14, 1987
Senate Energy and Natural Resources Committee

My name is Oliver Leavitt. I am the Vice President for Arctic Slope Regional Corporation (ASRC). ASRC is the Eskimo-owned regional corporation for the 56 million acre North Slope area of Alaska.

1. Background

ASRC presented testimony before this Committee on June 4, 1987. At that time, we commented on the Department of the Interior's Section 1002(h) resource assessment report on the coastal plain study area of the Arctic National Wildlife Refuge (ANWR). We also identified the nature of our direct interests in the pending Congressional decision on opening the coastal plain. Our interests include:

- Protecting the rights of the Eskimo residents of the Village of Kaktovik to pursue the life style of their choice, including their continued subsistence use of the coastal plain area;
- Removing the provisions of Section 1003 of ANILCA which prevent ASRC and Kaktovik Inupiat Corporation (KIC) from developing the oil and gas resources on the 92,160 acres of land we own within ANWR and within and adjacent coastal plain study area; and
- Supporting a policy to open the coastal plain area to competitive leasing, exploration and development under prudent and appropriate environmental regulations.

Mr. Chairman, I ask that the text of our June 4 testimony and submissions be incorporated by reference in today's hearing record together with my statement.

On behalf of ASRC's shareholders and the residents of the Village of Kaktovik, I want to commend the Committee for conducting a field trip in August to the North Slope and the coastal plain and for meeting with the people of Kaktovik.

The future of the coastal plain is of immense importance to the residents of the Village and to all of ASRC's shareholders. The visit of many of the Members of this Committee gives us greater confidence that Congress will carefully consider the importance of our cultural, subsistence and economic interests in the coastal plain decision.

2. Purpose of Hearings

Mr. Chairman, you have requested today's witnesses to specifically address how the oil and gas resources of the 1.5 million acre coastal plain study area can be competitively leased, explored and developed in a manner that is environmentally responsible and compatible with the purposes for which the Arctic National Wildlife Refuge (ANWR) was created.

The Inupiat Eskimo shareholders of ASRC welcome these hearings. The time has come to move the focus of the debate on the coastal plain away from rhetoric; away from the caricatures of "Big Oil" versus "caribou"; away from simplistic notions of "good" versus "evil"; and away from the polar extremes of "wilderness" versus "unregulated industrial development".

It is time for a reasoned and responsible examination of how the nation can have the major benefits of developing the potentially huge oil and gas resources of the coastal plain and, at the same time, protect this area's environment, its fish and wildlife resources and its subsistence users.

Mr. Chairman, as discussed in our June 4 testimony, the Eskimo people have been careful observers of oil development on the North Slope. We have, over the past twenty years, been critical of some proposals and some industry practices. We have litigated a number of those matters and brought others to the attention of regulatory agencies and the Congress. By and large, these issues have been fairly resolved.

We have studied the coastal plain issues carefully. Our 3700 shareholders are confident that the oil and gas potential of the 26 major prospects identified to date in the study area can be safely developed with proper planning and regulation. That clearly is the conclusion that has to be drawn from the history of Prudhoe Bay, the Kuparuk field and the Endicott field. These fields now produce almost two million barrels of oil per day; 23 percent of the nation's total domestic production. This oil is produced in a manner that is environmentally sound and, in general, compatible with the fish and wildlife resources of the North Slope and the interests of the Eskimo people.

Development of the North Slope has taken place under regulations and permit stipulations issued by the Secretary of

the Interior, the State of Alaska and the North Slope Borough. In our view, this development has served the national interest, has generally been properly regulated and has been sensitive to the environment and the wildlife which utilize the Slope.

This is not to say that no mistakes have been made in North Slope oil development over the past twenty years. Mistakes have been made and will be made in the future. This is to be expected in any large scale development taking place in a harsh and unique environnment. What is important is that the mistakes have not been serious and that the government and the operators have shown continuing progress and improvement in planning and regulation and in engineering and technology.

The major issue before the Committee is how to develop the coastal plain study area with minimal adverse impact on the study area's environment, its fish and wildlife resources and the Eskimo people who live on and use these lands. Every American has a critical stake in the coastal plain decision. But the Eskimo people of Kaktovik and the North Slope have the most at stake -- now and for the long term -- in how this issue is resolved.

3. NPR-A Drilling Program

Fortunately, there is a substantial body of knowledge, experience and precedent for confidently making a sound decision to open the coastal plain. There have been more than forty years of oil and gas exploratory and operational experience in the North Slope's Arctic environment.

The early years of experience were gained under the Department of the Navy's exploratory drilling program in the 23 million acre area -- then known as the Naval Petroleum Reserve-No. 4 -- west of Prudhoe Bay. Exploratory drilling was conducted by the Department of the Navy from 1944 to 1953. A number of oil and gas fields were discovered which would have been considered major fields if they were located in the lower 48 States. Because of Alaska's remoteness and high transportation costs, however, none of the fields were commercial.

My home, the Village of Barrow, now uses natural gas for heat and electricity. This gas was discovered as a result of the Navy exploratory program. A second round of exploratory drilling by the Federal government occurred between 1974 and 1980. Again, no commercial discoveries resulted from this program. But a great deal was learned.

4. The Prudhoe Bay Experience

The Committee can also draw on over twenty years of exploratory and operating experience at Prudhoe Bay and adjacent oil fields in the Central Arctic. That experience has been positive and constructive. Prudhoe Bay has led to very impressive improvements in Arctic oil and gas planning, in engineering and technology, and in understanding the Arctic environment. Kuparuk, Endicott and subsequently discovered fields reflect these improvements.

Prudhoe Bay has also led to refinements in the regulatory regime under which these activities are conducted. The North Slope experience has greatly expanded our knowledge of the area's fish and wildlife resources and their adaptability to properly regulated oil and gas exploration and development activities. This Committee needs to draw on that experience in determining the future of the coastal plain study area.

5. NPR-A Leasing Programs

In 1980, Congress adopted the Department of the Interior and Related Agencies Appropriation Act for Fiscal Year 1981 (Public Law 96-514 - Dec. 12, 1980, 94 STAT. 2964). One section of the Act authorized the opening of the 23 million acre area now known as the National Petroleum Reserve-Alaska (NPR-A) to competitive leasing, exploration and development.

There was little or no public controversy about the 1980 Congressional decision to open this area, about the environmental impacts, about the leases issued, or about the exploratory activities which have taken place in the NPR-A. Yet, the NPR-A is 15 times as large as the coastal plain study area. The Western Arctic caribou herd which utilizes the area is significantly larger than the Porcupine herd. The area is an important habitat for many species of waterfowl. Many of our Villages are located within the NPR-A. Far more Eskimo people utilize NPR-A for subsistence purposes than use the coastal plain area.

Our monitoring of the leasing program and extensive seismic surveys within NPR-A has disclosed no environmental, caribou or wildlife problems.

It is interesting to note that of the nine Members of this Committee who were in the Senate during the 1980 vote which opened the 23 million acre NPR-A to competitive leasing, eight Members voted "aye". I mention this because in the eyes of the Eskimos who live on the Slope, the wildlife and other issues which have been raised about the coastal plain are exactly the same. The difference is that the stakes -- in terms of the huge

and well known oil and gas potential of the coastal plain -- are much higher.

6. Proposed Modifications in S. 1217

With that background, I would like to proceed by making some specific suggestions and recommendations for the Committee's consideration. If it will assist the Committee, ASRC will have these suggestions reduced to legislative language.

To have a point of reference, Mr. Chairman, ASRC's suggestions will be in the form of proposed modifications or amendments to the only authorization bill now before the Committee, S. 1217, the "Arctic Coastal Plain Public Lands Leasing Act of 1987" introduced by Senators Murkowski, Stevens and others.

ASRC supports the enactment of S. 1217 with appropriate modifications to address a land use planning process, environmental issues and other matters of concern to ASRC and our shareholders.

S. 1217, as introduced, is structured as an amendment to the Mineral Lands Leasing Act of 1920 and adds a new sub-Chapter to the Act entitled "Coastal Plain Leasing". The operative provisions of S. 1217 are patterned very closely after the NPR-A leasing authorization contained in the FY '81 Appropriations Act. S. 1217 authorizes a competitive leasing program in the coastal plain to be followed by exploration and development of the lands leased.

Set forth below are the major changes in S. 1217 which ASRC proposes for the Committee's consideration.

(a) Land Use Planning Process

ASRC recommends that a new section be added to S. 1217 directing the Secretary to conduct a coordinated land use planning process which has as its goal avoiding unnecessary duplication of facilities in the coastal plain study area and consolidating, wherever possible, common facilities, activities and developments. The purpose of this planning process is to minimize adverse impacts to the study area's environment, its fish and wildlife resources and its subsistence users.

One Member of Congress has referred to this objective as minimizing the "footprint" of development wherever this is economically, technically and strategically possible. The oil industry, the North Slope Borough and the Village of Kaktovik should be active participants in this planning process. The schedule and location of lease sales should be related to both

tract nominations by industry and to this land use planning process.

The objective of the land use planning process is to achieve results similar to what has already been achieved in the Endicott field. No elaborate new planning procedure is proposed, no new studies are involved and no delay is contemplated. The planning process would proceed concurrently with the preparation of regulations to implement the competitive leasing program and to govern exploration and production activities.

As a part of this land use planning process, consideration should be given to utilization of existing facilities such as those at Prudhoe Bay, the abandoned Dew Line bases and the airport at Kaktovik. ASRC and KIC are prepared to provide land South of Kaktovik and Barter Island and to participate in the development of a consolidated model support and service base or bases to accommodate coastal plain exploration and developmental activities.

(b) Lands Leased

When the Department proceeds with preparations for conducting a lease sale within a particular area of the coastal plain study area, the Secretary should be directed to review the area or areas to be leased and to make a determination that those particular lands can be developed in an environmentally sound manner.

We suggest that the Secretary follow a practice that the oil industry has finally come to accept on the North Slope. That practice is to hire Eskimos who have local and historic knowledge of the area and its wildlife resources to assist in this review and determination.

(c) Monitoring and Research

Lands which are leased within the study area that have particularly high value for subsistence use and as habitat for fish and wildlife should be monitored and, where appropriate, research should be conducted with the objective of enhancing the compatibility of developmental activities with the well-being of the wildlife which utilize the area. A provision of this nature will ensure that activities conducted within the higher value coastal plain areas do not result in undetected or unanticipated adverse impacts on the wildlife of the study area. Here again, is a good project for hiring local Eskimo talent.

(d) Land Reclamation Responsibility

One problem area associated with North Slope energy development has been the occasional failure to conduct proper waste disposal and land reclamation. The problem was most serious with the Federal government's early NPR-A exploratory program in the 1940's and 1950's. But there have been infrequent problems at Prudhoe Bay, primarily with subcontractors and some companies in the oil service industry.

ASRC recommends language be adopted in S. 1217 which would make lease holders fully responsible and liable for reclamation of any significant disturbance on coastal plain lands. This responsibility would include the activities of all subcontractors and agents and could not be delegated or conveyed away, by contract or otherwise.

(e) Caribou Calving Area

Governor Cowper has proposed deferral of leasing in a 242,000 acre area of the coastal plain referred to as the "core calving area". The State acknowledges that this area contains 19 percent of the highest oil and gas potential of the coastal plain. Others have proposed that this area be designated as "Wilderness".

ASRC does not support delaying or excluding significant areas of the coastal plain from the competitive leasing program which S. 1217 authorizes. The burden of scientific evidence and the years of operating experience on the North Slope provide persuasive evidence that oil exploration and development on the coastal plain will result only in some minor displacement of caribou and other species which utilize the area for a small part of the year. This evidence is consistent with our people's observations as subsistence hunters of caribou and other wildlife on the coastal plain and on the North Slope.

ASRC believes that the "land use planning process" and "monitoring and research" approach we propose is a better policy for both the caribou and the nation. In the event that this Committee should nevertheless decide to accord this area special treatment, we recommend that the Secretary be directed to lease other prospects and areas of the coastal plain first. This area would then be leased after some concrete operating experience and knowledge has been gained.

(f) Environmental Regulatory Standard

Section 288(a)(5) of S. 1217 establishes the environmental and regulatory standard to govern activities on the coastal plain. This standard is virtually identical to

subsection (1) of the section in the FY '81 Appropriations Act which opened the 23 million acre NPR-A to competitive leasing. The standard provides as follows:

> "(5) Activities undertaken pursuant to this section shall include or provide for such conditions, restrictions, and prohibitions as the Secretary deems necessary or appropriate to mitigate reasonably foreseeable significant adverse effects on fish and wildlife and their habitat pursuant to subsection 288(b) of this Act."

It is our understanding that this language, together with section 288(b)(1) of S. 1217, grants the Secretary authority to impose all reasonable regulations, stipulations, conditions, restrictions and prohibitions which have been promulgated or utilized to govern North Slope energy-related activities. And further, that the Secretary is authorized to impose these and other new provisions as appropriate to the circumstances. The Committee may wish to make this understanding explicit in the bill or in report language.

The Committee may also wish to consider incorporating by reference, and authorizing the Secretary, to use the most recent, "state-of-the-art" regulations, lease terms, stipulations and permit conditions governing energy related activities in the Arctic. These would include: (1) all applicable provisions of Federal, State and local environmental law; (2) the twenty-nine stipulations and mitigation measures set out at pages 167-169 of the coastal plain report; (3) the environmental standards which governed seismic exploration activities on the coastal plain (50 C.F.R. § 37.31-33); (4) the stipulations for exploratory drilling on the private lands of ASRC-KIC in the August 9, 1983, exchange agreement; and (5) other appropriate regulatory models.

We are aware that many Members of the Congress have expressed the view that this Administration and the current Secretary lack "credibility" on issues involving environmental regulation of energy development. We anticipate, therefore, some effort to write detailed regulations, lease terms and permit stipulations into law. It is ASRC's judgment that the Committee should resist these efforts. The history of development of the North Slope's energy resources clearly demonstrates that the regulatory regime must evolve and change as legal requirements change, as new problems emerge, and as new technology and engineering improvements are introduced. Writing detailed stipulations and permit conditions into the law will freeze and retard further developments in improving and refining the process whereby adverse effects on the environment and fish and wildlife are avoided, minimized or mitigated.

(g) Revenue Sharing

It is common knowledge among those who support opening the coastal plain that a necessary precondition is that broad based public benefit must result from a portion of the revenues to be derived from bonus bids and royalties on coastal plain leases. This apparently means that some exception may be made to the general formula under which the State of Alaska receives 90 percent of the revenues from public lands within the State. The 1980 Appropriation Act opening the NPR-A to competitive leasing, for example, provides precedent for granting the State less than 90 percent of leasing revenues.

We understand that the State of Alaska will oppose any such proposed exception or modification. We believe, however, that there is room for compromise on this matter. ASRC leaves a decision to the good judgment of the Governor, the Members of this Committee and the Congress.

Should the Committee adopt a revenue sharing provision, ASRC recommends that the Committee consider allocating a portion of the new Federal revenues for the following purposes:

-- funding the Land and Water Conservation Fund (as has been proposed by Senator Johnston in S. 735);

-- acquiring critical habitat for new and expanded wildlife refuges in the lower 48 states, especially in the Pacific Flyway Region;

-- implementing the North American Waterfowl Plan;

-- funding needed demonstration projects for improving energy conservation and for bringing alternative energy technology into the market place;

-- improving access to and providing needed visitor facilities in Refuge areas in Alaska and elsewhere;

-- providing impact aid to the North Slope Borough, Kaktovik Village, and other communities affected by coastal plain exploration and development activities; and

-- applying any balance over one billion dollars received in any fiscal year to reducing the national deficit.

(h) Prohibition on Export of Coastal Plain Crude Oil

It is ASRC's understanding that the provisions of existing law prohibiting the export of Alaska North Slope crude oil are also applicable to crude oil produced on the coastal plain. To avoid extensive debate on this emotional subject and to keep it separate from the coming debate over the energy provisions of the U.S.-Canadian Trade Agreement, we propose that language be included in S. 1217 which makes clear that the limitations and prohibitions in existing law concerning the export of North Slope oil also apply to any crude oil produced from the coastal plain.

We strongly oppose, however, any effort which may be made to extend export prohibitions to North Slope natural gas. The North Slope contains huge reserves of natural gas. We believe that the 4.6 million acres of land on the North Slope owned by ASRC and by our Villages contain significant volumes of a natural gas. Bringing these reserves to market will be very expensive. Limiting potential markets with an export prohibition will only increase the cost of producing North Slope gas and further delay development of this resource.

(i) Training to Upgrade Native Job Skills

ASRC recommends the authorization of a training program to develop and upgrade the job skills of the local Eskimo people. The training program would focus on skills needed for employment in the oil and related industries. It would also include training programs for regulation of oil industry activities as well as training programs related to providing the public services required by the industry as well as public and private visitors to the coastal plain.

This training program could be conducted at existing facilities at Prudhoe Bay. It should be open to residents of Arctic Village and other communities who have expressed concern that coastal plain development could impact their dependence on caribou for subsistence. Their concern has been greatly heightened by the lack of employment opportunities in or near these villages.

(j) Impact Aid to Kaktovik Village, the NSB and Other Affected Communities

The Eskimo people expect fair treatment from the Congress. They understand that many policy issues they support will be resolved against them. But they do want due process, fair treatment and equal protection.

The people of the Village of Kaktovik, other North Slope Villages and the North Slope Borough were, therefore, shocked during the August Congressional visits to hear a number of Members of Congress suggest they could not support impact aid for affected Eskimo Villages or for the North Slope Borough.

My people, according to these Members, should be treated different than people in other communities of America which bear the economic burden and social disruption of accommodating large scale energy developments of national benefit. Some Members would treat us different because:

-- our business for profit corporations have entered into contractual lease agreements on our lands in the coastal plain with U.S. energy companies; and

-- our local government has incurred debt, financed by taxes on Prudhoe Bay facilities, to develop a minimal system for police and fire protection, medical care, electricity, water and sewage.

As an officer of ASRC and as a member of the North Slope Borough Assembly, I find this attitude very disturbing.

ASRC supports the position of the North Slope Borough and Kaktovik Village on impact aid which we understand will be submitted to the Committee in the near future.

(k) Sadlerochit Springs Special Area

The Secretary should be authorized and directed to issue special regulations to govern activities at the Sadlerochit Springs Special Area. This authority could be broadened to include other areas of the coastal plain which may, in the future, be found to be of unique character and interest. Our recommendation here does not include the so-called "core calving area" which is discussed above.

(l) Utukok Special Management Area

ASRC recommends that the Committee legislatively establish a new 1.5 million acre Utukok Special Management Area in the western portion of the North Slope. Establishment of this area for wildlife management purposes by the Bureau of Land Management would add an equivalent amount of acreage to the nation's wildlife management systems as is proposed for oil and gas leasing in the coastal plain study area of ANWR. Establishment of the new Special Management Area would, or course, be subject to the 1980 Congressional policy concerning leasing, exploration and development in NPR-A.

ASRC also supports expanding ANWR by 325,000 acres as is proposed in H.R. 2629, the House passed Submerged Lands Bill.

(m) ASRC's and KIC's Private Lands in ANWR

ASRC and KIC own 92,160 acres of private lands within ANWR and within and adjacent to the coastal plain study area. Whatever policy the Committee adopts concerning competitive leasing for the coastal plain, we urge the Committee to remove the current prohibition against development of our lands and to permit ASRC and KIC to develop the economic potential of our private property. Second, we urge the Committee to grant ASRC and KIC the appropriate authorization for a pipeline and other needed rights-of-way if and when our lands are found to contain commercial deposits of oil, gas or other minerals.

(n) Exclude ASRC and KIC's Lands From ANWR Boundaries

ASRC recommends that the Committee exclude the Village of Kaktovik and our 92,160 acres of private lands from the exterior boundaries of ANWR. Our lands represent only 4/10 of one percent of the Refuge's total area of 19 million acres.

Our experience with inholdings occupied by our Villages in conservation system units is that at some point in time the Federal land managers impose unacceptable restrictions on the life style and customary activities of Village people. This has already occurred at Anaktuvuk Village which is located in the Gates of the Arctic National Park. It is probably inevitable that ANWR's wildlife managers will one day try to manage the people -- as well as the Wildlife -- at Kaktovik.

(o) Kaktovik's Subsistence Requirements

Section 288(b)(3) of S. 1217 makes clear that nothing in the Act limits or affects the applicability of the National Environmental Policy Act or applicable environmental laws to the postleasing (exploration and development) phases of coastal plain

activity. ASRC recommends that language be included to make clear that where Environmental Impact Statements (EIS) on proposed exploratory or developmental activities are required, one section of the EIS specifically address potential impacts on the subsistence requirements and cultural traditions of the Eskimo residents of the Village of Kaktovik.

(p) Annual Report

ASRC recommends that language be added to S. 1217 to require the Secretary to report annually to the Congress on the status of the coastal plain leasing program. The report should be prepared in a manner which will assist Congress in conducting legislative oversight of the leasing program and the subsequent exploration and developmental phases of activity.

(q) Other Environmental Considerations

Should the Committee determine, on the basis of the record of this proceeding, that opening the coastal plain study area will require additional assurances of environmental protection and safe operation, we recommend the Committee review and consider two precedents from the Trans-Alaska Pipeline Act of 1973. The first is to consider establishing a standard of "strict liability" on coastal plain lease holders for any damages resulting from their operations and activities. The second is to consider establishing a "Coastal Plain Liability and Reclamation Fund," funded by a per barrel fee on commercial oil production from the coastal plain, until an appropriate level of revenue has accumulated in the Fund. The Fund's revenues would be available to compensate for any damages, to reclaim lands, to restore other North Slope lands disturbed by early governmental drilling programs, to conduct research, or such other purposes as the Committee determines are appropriate.

(r) General Provisions in S. 1217

While ASRC endorses S. 1217 with the modifications proposed above, a few provisions of the bill as introduced merit comment.

(i) The Independent Producer

Section 288(a)(3)(E) (page 7, line 19) directs the Secretary to make "reasonable efforts to conduct lease sales in a manner which will enable independent oil and gas producers . . . to have a competitive opportunity to successfully bid on leases . . ." within the coastal plain. As a small minority owned company active in the energy business, we endorse this provision. We recognize, however, that conducting oil development in the Arctic in conformity with stringent

environmental requirements requires both experience and substantial capital. We recommend that the leasing regulations should address these issues.

(ii) Litigation and Delay

Section 288(b)(2) (page 9, line 8) provides that the Department's coastal plain report and legislative environmental impact statement (LEIS) satisfy all applicable legal requirements and provide an adequate basis for developing and implementing the competitive oil and gas leasing program within the coastal plain. ASRC supports this provision. No useful purpose is served by leaving the development and implementation of the competitive leasing program open to litigation and delay over the adequacy of the underlying documents. Congress has reviewed these documents and supplemented them with testimony. Congress will make the policy decision on the coastal plain study area. The Secretary should be free to implement the policy of the Congress without litigation and unnecessary delay over questions concerning the adequacy of the LEIS or the resource assessment report.

The Committee may wish to consider adding a requirement that litigation on Environment Impact Statements be initiated within ninety days of their issuance in final form. This was done in the 1980 Act authorizing the NPR-A leasing program.

(iii) Mutual Arctic Interests

Section 288(d) authorizes and encourages negotiations between the U.S. and Canada on a number of energy, environmental and economic issues in the Arctic region. We endorse this provision. The Alaska Eskimo Whaling Commission has very significant concerns about a proposed plan by a Canadian oil company to transport crude oil produced offshore in the Canadian Beaufort Sea by barge or tanker to an area west of Barrow for transhipment to Japan or Korea. Ice conditions pose significant risks and dangers to this proposed means of transport which goes through areas extensively used by Bowhead Whales and other marine mammals. This is an issue which should be made the subject of negotiations. Further, a joint study should be made of the feasibility of using overland Pipeline routes, including the TAPS line when the pipeline has excess capacity, for moving Canadian Beaufort Sea oil reserves to market.

Conclusion

Mr. Chairman, that concludes my testimony. Enactment of the legislative provisions we propose would serve the nation's long- and short-term interests. It would result in a balanced and responsible Arctic oil policy for the Nation. It will not resolve the Persian Gulf crisis, but it moves in the right

direction. It will not win the support of hard core environmentalists, but it will assure safe and environmentally responsible development of the coastal plain's hugh oil potential. It will not represent the final treatise on caribou, but it will protect the fish and wildlife my people rely upon for subsistence every day of every year.

In conclusion, I want to comment on the evolution of this issue over the past year as seen by an Eskimo who lives on the top of the world. From November 1986 through early summer of 1987, the issue was the Porcupine caribou herd and the "core calving grounds" on the coastal plain. This year most caribou calved in Canada. The issue then shifted and became "industrial pollution". About the time of the Congressional visits, the issue became how the coastal plain fits into "national energy policy". More recently, the issue appears to be a stark choice between "wilderness" designation and a regulated and responsible development policy based on, and taking advantage of, prior North Slope experience.

We are now getting down to the real issues: the facts, the record of North Slope development, and the interests of the people of the United States.

These issues are now before this Committee for decision. This is where they belong. The Members of this Committee will have to sort out the relationships between the Persian Gulf, the Strategic Petroleum Reserve, declining domestic reserves, rising import dependency and the relationship of all of these issues to the domestic oil and gas potential of the coastal plain study area. You have to decide the future policy for the coastal plain.

On behalf of the Inupiat people, I appreciate your courtesy in hearing our views.

Appendix C

AMENDMENT

LOCAL IMPACT AID

Section 501 at page 35 is amended by reducing the per centum in line 16 by one percentum and adding the following new subsection (e) at the end of the Section:

"(e) one (1) percent, subject to the limitations contained in Section 504, to be paid into the Impact Aid Fund for distribution to the Village of Kaktovik and other impacted Villages and governments as provided in Section 901."

At the end of the bill add a new Section 504 as follows:

"SEC. 504. IMPACT AID FOR AFFECTED NORTH SLOPE COMMUNITIES AND GOVERNMENTS. (a) There is established in the Treasury of the United States an Impact Aid Assistance Fund (Impact Aid Fund) for North Slope communities and governments adversely impacted by oil and gas leasing, exploration and development activities on the public lands of the Coastal Plain. The Impact Aid Fund shall consist of revenues paid into the Impact Aid Fund pursuant to Section 501(e). Payments to the Impact Aid Fund shall be suspended for any periods of time when the Fund has a $10 million balance. Payments shall resume when the balance falls below $5 million.

"(b) The Secretary of the Interior shall conduct a study of projected impact aid needs and establish and administer a local impact aid program to provide necessary financial assistance to North Slope Villages and governments adversely affected by exploration and development of public lands on the Coastal Plain. Assistance shall be provided to adversely affected communities and governments for purposes of: (1) planning for mitigation of the potential effects of exploration and development on environmental, social, cultural, recreational, and subsistence values, and (2) planning, developing, and carrying out projects and programs that provide new or expanded public facilities and fire, police and medical services, necessitated by the presence of oil industry and governmental personnel in connection with

exploration for, and the development and production of, oil, gas, and other minerals from the Coastal Plain. The Secretary shall certify grants from the Impact Aid Fund upon a finding by the Secretary, after giving notice to the Governor of Alaska, that the grant is required to carry out the purposes of this section.

"(c) No more than $5 million of grants may be certified by the Secretary under subsection (b) for payment from the Impact Aid Fund in any calendar year.

"(d) This authorization shall terminate within 15 years after date of enactment. Following termination, revenues in the Impact Aid Fund shall be paid to miscellaneous receipts in the Treasury.

"(e) The Secretary may extend eligibility to Venetie and to Arctic Villages if he determines they are adversely affected."

Appendix D

Add a new section to S. 406 as follows:

Sec. ____. The Secretary is authorized to convey the surface estate to Kaktovik Inupiat Corporation and the subsurface estate to Arctic Slope Regional Corporation of any lands within the coastal plain of the Arctic National Wildlife Refuge withdrawn by the Secretary for selection by Kaktovik Inupiat Corporation pursuant to Section 22(j)(2) of the Alaska Native Claims Settlement Act, as amended.

Appendix E

2/28/89

MEMORANDUM

Re: Exploratory Drilling on Private Lands Owned by Arctic Slope Regional Corporation in the Arctic National Wildlife Refuge

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1. Arctic Slope Regional Corporation

Arctic Slope Regional Corporation (ASRC) is the Native-owned regional corporation established pursuant to the Alaska Native Claims Settlement Act of 1971 (ANCSA) by the 3,700 Inupiat Eskimo people of Alaska's North Slope. As the regional corporation for the Native people of Alaska's North Slope, ASRC received under ANCSA a modest settlement of land and cash in exchange for the extinguishment of the aboriginal title claim of the Inupiat people to the entire North Slope of Alaska.

2. 1983 Land Exchange

On August 9, 1983, Arctic Slope Regional Corporation and the Secretary of the Interior executed a land exchange agreement pursuant to which ASRC conveyed to the United States 101,000 acres of surface estate inholdings within Gates of the Arctic National Park in exchange for the rights to 92,000 acres of subsurface estate in the Arctic National Wildlife Refuge (ANWR) beneath surface estate owned by Kaktovik Inupiat Corporation (KIC), the Native village corporation for the Village of Kaktovik. ASRC took title to the subsurface estate at Kaktovik subject to specific contractual limitations on its private property rights, including strict environmental stipulations intended to protect the fish and wildlife and other environmental values of this area. This memorandum will briefly review the provisions in the land exchange agreement and the appended environmental stipulations that govern ASRC's right to engage in exploratory drilling on its subsurface estate within ANWR.

3. Environmental Stipulations

Included as Appendix 2 to the August 9, 1983 exchange agreement is a set of extensive land use stipulations which apply to ASRC, its successors and assigns. These stipulations are intended, by their own terms, "to ensure that the conveyance

to ASRC of the subsurface estate of those lands . . . will not undermine the essential integrity of the Arctic National Wildlife Refuge and will not frustrate the purposes of the Refuge." These stipulations provide a detailed set of procedural and substantive stipulations that apply to any exploratory or developmental activities that ASRC may undertake with respect to its subsurface estate.

4. Exploratory Drilling on ASRC Lands

The stipulations in Appendix 2 explicitly contemplate exploratory drilling by ASRC upon receipt of the Kaktovik subsurface in 1983. Indeed, paragraph B of the stipulations, entitled "Oil and Gas Exploration" (pages 5 through 29 of Appendix 2), establishes a detailed set of stipulations governing any oil and gas exploratory activities on the ASRC subsurface estate. Paragraph B.4.(e), beginning on page 22 of Appendix 2, provides specific environmental safeguards governing exploratory drilling activities.

5. Limitations on ASRC's Rights

ASRC's right to engage in oil and gas activities on its Kaktovik subsurface estate is not, however, unlimited. Paragraph B.2. (page 6 of Appendix 2) precludes any oil and gas "development or production" from ASRC lands until Congress authorizes such activities on lands within the coastal plain of ANWR or on the ASRC lands.

Paragraph B.1.(page 5 of Appendix 2) establishes specific limitations on ASRC's right to engage in exploratory drilling on its subsurface estate. Because the coastal plain, as defined in section 1002 of the Alaska National Interest Lands Conservation Act (ANILCA), excluded the lands owned by KIC in 1980, ASRC is free to engage in exploratory drilling on the subsurface estate beneath the original KIC surface estate. This right to engage in exploratory drilling on the original KIC lands was effective as of the date of receipt by ASRC of the underlying subsurface estate in 1983. Indeed, ASRC has exercised this right, permitting thus far the drilling of a well (the KIC No. 1 well) east of the Village of Kaktovik in 1984-1985.

KIC also had a right to receive an additional 23,000 acres of surface estate from within the coastal plain as defined in ANILCA. ASRC agreed, as a contractual matter, in paragraph B.1. of Appendix 2 to refrain from exploratory drilling on the subsurface estate which it may receive beneath KIC surface estate within the coastal plain until Congress takes one of three possible actions, by enacting legislation

that: (i) permits exploratory drilling within the coastal plain, (ii) permits oil and gas development and production within the coastal plain, or (iii) permits oil and gas development or production on the ASRC lands. By its terms, this contractual limitation expires upon action by Congress permitting exploratory drilling or oil and gas development within the coastal plain or on the ASRC lands. Upon any of these Congressional actions, ASRC is free to engage in exploratory drilling on any of its lands, including its subsurface estate within the coastal plain.

6. Effect of Further Action by Congress

A. Environmental Stipulations

The substantive provisions of the environmental stipulations in Appendix 2 remain in full force and effect until superceded by the provisions of a later act of Congress. Paragraph B.9. (pages 27 through 29 of Appendix 2) specifically provides that the environmental protections of Appendix 2 remain in effect until superceded by self-executing provisions of legislation that permits exploratory drilling or oil and gas development on the coastal plain or on the ASRC lands, or by rules and regulations promulgated by the Department of the Interior that govern such oil and gas exploration and development. At that time, the new environmental protections set forth in the legislation or in the regulations promulgated by the Interior Department replace the substantive environmental protection provisions of Appendix 2. However, paragraph B.9. assures the preservation of the procedural mechanisms for review of ASRC plans of operations contained in Appendix 2 notwithstanding the development of a different regulatory regime with respect to oil and gas exploration and development activities on Federal leases in the coastal plain.

Nothing in paragraph B.9. limits ASRC's rights to engage in exploratory drilling, whether on the original KIC lands or on the ASRC lands within the coastal plain. Rather, the provisions of paragraph B.9. establish the mechanism whereby ASRC accepts new environmental stipulations imposed either through self-executing provisions of the ANWR legislation or through the regulations promulgated by the Interior Department pursuant to this statutory authority.

B. Rights to Engage in Exploratory Drilling on ASRC Lands

Only paragraph B.1. of Appendix 2 establishes limitations on ASRC's rights to engage in exploratory drilling. Once the Congress has taken any of the three actions described

in paragraph B.1. (and described in detail in section 5 of this memorandum), the prohibition on exploratory drilling on ASRC lands within the coastal plain is automatically terminated and ASRC may proceed with exploratory drilling on these lands. The reference in paragraph B.9. to the provisions of paragraph B.1. merely states that the provisions of paragraph B.1., including the automatic termination of the prohibition on exploratory drilling on ASRC lands within the coastal plain, remain in effect even after Congress acts on ANWR legislation.

Thus, under the provisions of the August 9, 1983 exchange agreement with the United States, ASRC's rights to engage in exploratory drilling on the subsurface estate that it received pursuant to that exchange transaction are clearly set forth. With respect to the subsurface estate beneath the lands held by KIC in 1980 (lands not in the coastal plain), ASRC had the right upon receipt of that subsurface in 1983 to engage immediately in exploratory drilling, subject only to the environmental stipulations set forth in Appendix 2 to the exchange agreement. With respect to the 23,000 acres of subsurface estate received by ASRC within the coastal plain, ASRC's right to engage in exploratory drilling is effective upon action by Congress permitting exploratory drilling or oil and gas development within the coastal plain or on ASRC lands. This right to engage in exploratory drilling on ASRC lands within the coastal plain upon act of Congress is a property right for which ASRC explicitly bargained in the 1983 exchange agreement. Any attempt by the Congress to limit ASRC's right to engage in exploratory drilling on these lands following Congressional action would be an unlawful taking of the contractual rights for which ASRC bargained and paid valuable consideration to the United States. Such an unlawful taking of ASRC's contractual rights could result in substantial liability to the United States.

Appendix F

Make the Major Oil Company Amendment an amendment of "general applicability" to all future Federal OCS and onshore lease sales. Legislative language to implement this policy would provide that:

> "No person may drill a well on any lands within a zone of five miles of any proposed onshore or offshore Federal lease sale after the date on which a proposed tract or tracts have first been noticed in the Federal Register as a call for information and nominations, up until the day before the first lease sale in the sale area has been conducted."

JOINT STATEMENT

Submitted by

C.E. DeFRIES, PRESIDENT
NATIONAL MARINE ENGINEERS' BENEFICIAL ASSOCIATION

and

J.P. WALTERS, EXECUTIVE DIRECTOR
JOINT MARITIME CONGRESS

to the

COMMITTEE ON ENERGY AND NATURAL RESOURCES
U.S. SENATE

on

OIL AND GAS DEVELOPMENT IN THE ARCTIC NATIONAL WILDLIFE REFUGE

March 6, 1989

JOINT STATEMENT SUBMITTED BY THE
NATIONAL MARINE ENGINEERS' BENEFICIAL ASSOCIATION
AND THE
JOINT MARITIME CONGRESS

March 6, 1989

The National Marine Engineers' Beneficial Association, a union of 50,000 members representing merchant marine seamen and others, along with the Joint Maritime Congress, an association representing most major U.S.-flag vessel operating companies, believe strongly that the northern portion of the Arctic National Wildlife Refuge (ANWR) should be opened to oil and gas exploration and development. We believe that action now on ANWR is extremely important to America's long-term economic, energy, and national security.

We advocate this position with one important caveat: any oil discovered in the ANWR area should be used for domestic consumption only. We recommend that this proviso be written expressly into any legislation authorizing exploration and development. It is not enough to assume that the issue is solved simply because ANWR crude will most likely travel through the pipeline to Valdez and hence be subject to the restrictions contained in the Export Administration Act of 1979, as amended. Crude oil from ANWR might, for example, be transshipped along the northern coast of Alaska to larger supertankers waiting in the Arctic Ocean above the Bering Strait. This, we note, already is being seriously contemplated by the Canadians for oil they extract adjacent to ANWR. If ANWR oil followed this path of transportation, every barrel could go for export.

Allowing the export of ANWR oil would be poor energy policy (when we already import nearly 50 percent of our oil), poor security policy (since we would have to import more oil from the Middle East to replace any exports),

and it makes no sense whatsoever to the American people. Indeed, we believe that making clear to the American people that ANWR oil will be for domestic use is fundamental to the rationale for ANWR from the start. Americans will not have it any other way.

If exploration and development are granted, they can only be justified in terms of energy security. And if this is the case, then Americans should receive ironclad assurances that energy security will not be tossed out the window for quick profits from exports once approval is granted.

Mr. Chairman, we are submitting this statement, and we have joined others in a coalition to promote ANWR development for three basic reasons.

First, opening ANWR is of great importance to the future of America's maritime industry, particularly its tanker fleet. Today, U.S.-flag carriage of Alaska's North Slope crude oil accounts for more than one-half of the U.S.-flag tanker fleet. Nearly 70 tankers are employed. As Prudhoe Bay and other fields to the west of ANWR draw down, business for these tankers will dwindle accordingly. ANWR, therefore, offers decades of potential cargoes for a fleet that otherwise would shrink with alarming speed. If we delay on ANWR, then there will be a gap, a gap that lengthens with each year of delay, between Prudhoe Bay wind-down and ANWR start-up. Tankers and crews would be idled and lost, the former to the scrap heap and the latter to other professions. For our industry, delay and more delay is not an acceptable course.

Our second reason for supporting ANWR development is that the benefits to our national security of opening a portion of the ANWR area to exploration and

drilling are undeniable. Its oil would flow just as Prudhoe Bay production is expected to be reduced significantly. It would help maintain the U.S.-flag merchant fleet and its availability for national defense. It would come on-stream when today's "oil glut" will probably be but a distant memory. It would provide America with an energy supply "cushion" that -- in conjunction with increased conservation and continuing efforts to reduce energy consumption and develop alternative energy sources -- would be vital in the early years of the next century. And it would reduce American dependence on imports of foreign oil, especially from the ever-volatile Middle East, helping to preserve our ability to act independently as a great nation with global responsibilities must do.

This second point, we believe, is what the entire argument over this issue boils down to -- national security and national freedom of action. Our nation will, of course, always require some imports, but opening this new field and using it to reduce imports, in conjunction with continued efforts to conserve, will enable our nation to keep these imports at prudent levels. For this reason, we reiterate that oil obtained from the ANWR area should be for domestic use only, to reduce our dependence on foreign oil as Prudhoe Bay has done already, and so successfully, for the past decade. To us, it is abundantly clear that locking away this oilfield of enormous potential in a "wilderness" status forever would only diminish seriously our national security and political and economic freedom of action -- assets that are vital in an increasingly fragmented and changing world. Local environmental impact can be minimized and dealt wtih succcessfully as it already has been in the Prudhoe Bay area. Indeed, the Prudhoe Bay experience, and the lessons learned

from it, offer the opportunity to reduce even further the environmental impact that may come from exploration and drilling in the ANWR area.

Our third basic justification for ANWR development concerns our nation's trade deficit. Every barrel we develop at home is one less barrel we have to pay for abroad. The barrels we develop at home will mean between $150 - $200 billion saved in our trade deficit over the projected life of the ANWR fields. Given the importance of this deficit to our economy, ANWR development clearly can be extremely beneficial to all Americans.

For all these reasons, we believe strongly that exploration and drilling in the ANWR area should be permitted on an expeditious basis so long as it is made clear that ANWR oil will not be exported. ANWR exploration and development should not be delayed, or endlessly studied and reviewed at a cost of precious time. Any solution less than this is simply one our nation cannot afford.

Thank you.

STATEMENT

SUBMITTED BY

CHARLES J. DIBONA

PRESIDENT, AMERICAN PETROLEUM INSTITUTE

BEFORE THE

SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES

UNITED STATES SENATE

MARCH 6, 1989

Summary

o The oil price fall of recent years already has caused a substantial increase in U.S. dependence on imported oil. Imports have risen from about 32 percent of total consumption in 1985 to 42 percent in 1988. This trend could have serious adverse economic and national security consequences.

o The oil price decline has had devastating effects on domestic petroleum exploration and development. Exploration-production capital expenditures, drilling activity, and well completions all are far below their levels of the early 1980s.

o Energy projections of several authoritative groups based on different assumptions and techniques are in general agreement on basic trends: they expect U.S. oil consumption to increase and production to decline. Most projections indicate that the U.S. will be importing well over half of its oil requirements by 1995 if oil prices remain low.

o Greater demand for imported oil by the U.S. will increase the demand for oil from OPEC nations, which hold about three-quarters of the free world's oil reserves and nearly all the current surplus production capacity. Thus, world oil markets could tighten considerably in the next few years if OPEC capacity remains constant or expands only slightly.

o If OPEC oil production expands as world oil demand rises and world oil prices consequently remain low, growth in U.S. oil import dependence will be accelerated. Greater U.S. oil import dependence means greater vulnerability to world oil supply disruptions and increased constraints on U.S. foreign and military policies.

o The Coastal Plain of the Arctic National Wildlife Refuge (ANWR) could contribute substantially to U.S. oil supplies, and by so doing could help to alleviate U.S. vulnerability. Overall production from other important fields in Alaska may already have begun to decline. Because of long lead times required for Alaskan exploration and development, a leasing program should begin now to ensure the timely availability of new supplies. If the nation waits until a crisis occurs before taking action, there would be no way for ANWR oil to help alleviate the crisis.

o The U.S. Department of the Interior (DOI) has concluded that if there is economically recoverable oil present in the area, there is a 95 percent chance for more than 0.6 billion barrels and a 5 percent chance for more than 9.2 billion barrels. The DOI's mean estimate for recoverable oil is 3.2 billion barrels. Only two oil fields ever discovered in the U.S., Prudhoe Bay and East Texas, have had more than 3.2 billion barrels of recoverable oil. If future ANWR production is near the high end of the estimated range for several years, the reduction in U.S. oil imports would equal

the saving that would be obtained by completely eliminating all oil use in residential and commercial buildings in the U.S. during those years.

o Development of the ANWR Coastal Plain's oil could provide important national economic benefits. (1) Economic activity would increase both in finding, producing and transporting ANWR oil and in supplier industries. (2) The stronger economy, as well as leasing and production activity in ANWR, would yield revenues to reduce the federal deficit. (3) ANWR oil production would reduce U.S. import demand, lower U.S. expenditures for oil imports, and, thereby, improve the nation's international trade balance. This also could hold the future world oil price below the level that it otherwise would rise to, thus benefitting American consumers as well as consumers in other oil importing countries.

o Energy conservation can help to restrain the growth in oil imports, but an effective national energy policy cannot be built on conservation alone. Because U.S. oil production is falling, if government works solely on the demand side, it would require massive intervention to stabilize imports in the 1990s. That is why the government needs to take a balanced approach -- encouraging economically efficient energy conservation on the demand side and removing unnecessary impediments to domestic production on the supply side. Authorizing the leasing of ANWR would be an important positive step.

o The petroleum industry's record in developing and producing oil fields on the Alaskan North Slope and in transporting this oil indicates that such operations can be and are being conducted in an environmentally sound manner. The Alaskan experience also has improved the petroleum industry's ability to operate in harsh environments.

o The ANWR Coastal Plain presents an exciting opportunity. Little is to be lost by permitting leasing and exploration -- if commercially producible discoveries are not made, petroleum activities will cease, there will be no appreciable risk of environmental damage, and the land will be restored to a natural state. If commercial finds are made, the national benefits could be enormous.

Introduction

U.S dependence on oil imports is increasing. If this trend is not arrested, it will have serious national economic and security consequences. The following discussion first will explain why the uptrend in oil imports is occurring. Secondly, it will outline the major implications of greater import dependence. The discussion then will address how development in ANWR's Coastal Plain could significantly alleviate U.S. energy problems.

Recent Trends in Oil Consumption, Production, and Imports

The price of oil rose sharply in 1973-1974 during the oil embargo, and again in 1979-1980 in connection with the Iranian supply disruption. The price peaked in 1981, at an annual average of about $37 per barrel, roughly ten times its pre-embargo level. Since 1981, the price has fallen by 55-60 percent (and by about 70 percent after adjustment for inflation).

In the late 1970s, largely in reaction to previous oil price increases, U.S. oil consumption began to fall and production to rise. Consequently, gross oil imports fell from their peak of 8.8 MMBD in 1977 to 4.8-5.3 MMBD during the 1982-1985 period. Imports were reduced from 47.7 percent of total consumption in 1977 to 31.5 percent of consumption in 1985.

Moreover, studies have shown that consumer and producer responses to higher oil prices would have been even greater were it not for U.S. price controls, which limited the prices of domestically produced crude oil and oil products until 1981, and were it not for the so-called Windfall Profit Tax of 1980 which continued to prevent U.S. oil producers from obtaining the full benefits of the world price.[1] Fortunately, this tax finally was repealed in 1988.

Outside the U.S., oil consumption fell substantially after 1979, while oil supplies were augmented by newly developed non-OPEC sources such as the North Sea, Mexico and Egypt. As a result of decreased oil import demand both in the U.S. and in the rest of the free world, demand for OPEC oil dropped by about 14 MMBD, or about 45 percent, between 1979 and 1985. After Saudi Arabia increased its output in late 1985, the price of oil collapsed. And although the price has rebounded from the extremely low levels of mid-1986, it still is well below its late-1985 level.

In response to the price drop, U.S. oil consumption rose and production fell after 1985. These developments reversed an 8-year downward trend in U.S. reliance on oil imports. Imports rose from 31.5 percent of total oil consumption in 1985 to 37.9 percent in

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[1]See Joseph P. Kalt, The Economics and Politics of Oil Price Regulation in the Post-Embargo Era, Massachusetts Institute of Technology Press, 1981; and American Petroleum Institute, Domestic Petroleum Production and National Security, December 1986.

1986 and to 42 percent in 1988. In January of this year, imports exceeded 8 million barrels per day for the first time since the beginning of the decade. In recent months, imports have exceeded domestic production.

Lower oil prices also have affected oil consumption and production outside the U.S. Based on International Energy Agency data, non-U.S. free-world consumption outside of OPEC was up an average of almost 2 percent per year since 1985, compared with about a 2.5 percent average annual decline during the previous six years. On the supply side, non-U.S. free-world production outside of OPEC was up less than 2.5 percent per year since 1985, compared with about a 7 percent average annual rate of increase in the previous six years.

In summary, it is clear that the fall in oil prices has had a stimulative effect on U.S. and free-world oil consumption and a negative effect on non-OPEC oil production. In addition, as discussed in the next section, the oil price fall has so discouraged exploration and development in the U.S. that further declines in domestic oil production are likely.

The Effects of the Oil Price Fall on Domestic Oil Field Activity

The fall in oil prices and consequent decline in the profitability of oil field investments has caused a sharp reduction

in domestic petroleum exploration and development activity. Domestic exploration-production capital expenditures by the leading oil companies decreased by about 25 percent between 1981 and 1985. In 1986, these companies cut their domestic exploration-production spending almost in half. The downward trend continued in 1987 before a slight increase in 1988. Domestic exploration-production capital spending in 1988 still was only about one-half the 1985 level and about one-third the 1981 level. Advance indications of company spending plans for 1989 suggest little improvement.

The number of rotary drilling rigs active in the U.S. fell from a high of about 4,500 in late 1981 to about 1,900 by year-end 1985. The rig count then tumbled to less than 700 in the summer of 1986. It has fluctuated since then but it still is below 800.

Consequently, the number of wells completed in the U.S. decreased after 1981, falling by about 23 percent by 1985. Well completions plummeted nearly 50 percent in 1986, a drop of more than 30,000, the largest annual decline on record. And the decline continued in 1987 and 1988 as well completions fell by an additional 9,000. Overall, well completions have fallen in the U.S. from more than 89,000 in 1981 to about 31,000 in 1988.

The net result of this decline in domestic oil field activity is that the U.S. is not replacing the oil reserves that it uses up. Since 1985, the U.S. replaced only about 80 percent of the oil that

was produced. This, of course, reduces the nation's ability to maintain production in the future. Indeed, despite major cost reductions and efficiency improvements within the domestic oil industry, it appears unlikely that the industry will be able to maintain production at probable oil price levels.

The Likely Future Trend of Oil Imports

The American Petroleum Institute has reviewed a number of recent energy projections by government and private organizations in order to determine expected trends in U.S. oil consumption, production, and imports over the next ten years or so. Although the projections are based on different assumptions and techniques, they are in general agreement on basic trends: they expect U.S. oil production to decline, consumption to increase, and imports to rise considerably during the next decade.

Recent projections prepared by the U.S. Department of Energy and published in its 1989 Annual Energy Outlook are representative. The department's "base case" looks for oil production including natural gas liquids production to fall from 9.9 million barrels per day in 1988 to 8.0 million barrels per day in 1995 and to 7.8 million barrels per day in the year 2000, assuming that the world oil price rises in real terms at an average rate of 5.5 percent annually. The department's alternative "low price" case, which assumes that the oil price will rise in real

terms at an average of 3.3 percent annually, looks for production to fall to 7.7 million barrels per day in 1995 and to 7.1 million barrels per day in 2000. Even though the Department of Energy projects relatively slow growth in U.S. oil consumption -- 0.8 percent per year in the base case and 1.2 percent per year in the low price case -- it nevertheless expects oil imports to increase substantially. In the base case, gross oil imports are projected to equal 57 percent of 1995 consumption and 59 percent of consumption in 2000. In the low price case, imports are projected at 60 percent of 1995 consumption and 65 percent of consumption in 2000.

Several factors support projections of a rapid rise in import dependence. The U.S. is a relatively high cost oil producer, and in all probability it cannot maintain production at prices like today's. In fact, the decline in production may begin to accelerate because Alaskan production has stopped rising and actually declined over the past two months. In the previous four years, gains from Alaskan production had added 40,000 to 100,000 barrels per day to U.S. production and helped to offset lower-48 declines.

In addition, federal policies in several areas -- including taxation, natural gas regulation, land access, and environmental regulation -- continue to inhibit domestic energy development. The trend of rising consumption also is likely to continue. In 1988,

the increase in deliveries was more than 3 percent and so far in 1989 the data suggest a similar growth in demand is occurring. Given such trends, import dependence can be expected to grow.

Economic Costs of Increased U.S. Reliance on Oil Imports

Importing oil rather than producing it domestically imposes two types of costs on the U.S. economy. First, higher U.S. oil imports increase world demand relative to supply and hence tend to raise the world price of oil. Secondly, higher U.S. oil imports relative to world production capacity increase the probability of a sudden spurt in world oil prices and intensify the effects should some physical event shock the world market (generally referred to as "disruption costs").

A growing U. S. demand for foreign oil translates, almost barrel for barrel, into a growing demand for OPEC oil because it is the OPEC countries that possess the excess production capacity needed to meet demand growth. Furthermore, most of OPEC's spare capacity is found within a single region of the world: the Persian Gulf. Production capacity elsewhere in the free world is not expected to change much over the next several years. Developing countries may produce somewhat more than they do now but developed countries besides the United States are expected to produce somewhat less.

In the world oil market, the prospect for oil price increases depends to a great extent on the size of demand relative to the amount of capacity available to meet that demand. Studies by the U.S. Department of Energy, the National Petroleum Council, the American Petroleum Institute, and the Harvard University Energy and Environmental Policy Cente have all suggested that growing consuming country demand will progressively absorb a larger share of available OPEC production capacity. If this occurs, the world oil market will tighten and prices could rise, perhaps very substantially. This, in fact, has been the historical experience. From 1974 until about 1985, the rate of increase in cartel prices varied directly with the rate of capacity utilization in the cartel.

The demand for OPEC oil has been increasing since the oil price collapse. If OPEC capacity stays at its current level, the cartel could be utilizing 80 percent of its capacity in about 3 to 5 years, depending on such factors as the rate of economic growth in consuming countries over the next few years and the precise level of world oil prices. Thus, the world oil market may become much tighter in a relatively short time.

However, OPEC production capacity may not remain fixed at present levels. The OPEC countries, and particularly those countries in the Persian Gulf, undoubtedly possess the resources to increase oil production capacity substantially. Should these

countries choose to increase capacity -- whether because individual countries seek to increase their market share, or for other reasons -- oil prices could remain relatively low for more than 3 to 5 years even if demand expands.

As a large net oil importer, the U.S. benefits from low oil prices. However, the longer low oil prices last, the greater the U.S. import dependence and the greater both the probability of an international supply disruption and the damage such a disruption would do to the U.S.

Concentration of oil supplies in a politically unstable area like the Middle East increases the risks of a supply disruption. The U.S. can mitigate the impact of an unfavorable Middle Eastern development on the world oil price, however, by reducing its demand for imported oil, thereby creating greater slack in world oil markets.

A disruption has the direct effect of transferring wealth from oil-importing to oil-exporting nations. In the current context, a cutback in foreign oil production that caused the oil price to rise by $10 per barrel would transfer from the U.S. more than $25 billion per year, or about one-half of one percent of the U.S. gross national product (GNP).

In addition to the wealth transfer effects of an oil supply disruption, researchers have estimated substantial additional costs. Econometric estimates of the overall macroeconomic effects of supply disruptions have been much larger than the direct wealth transfer effects. For example, simulations utilizing the macroeconomic models of Data Resources Inc., Wharton Econometric Forecasting Associates, and Lawrence H. Meyer Associates performed for the National Petroleum Council indicate that the 1973-1974 oil price jump reduced the U.S. GNP by about 2.5 percent within three years, while the 1979 price jump reduced U.S. GNP by about 3.5 percent within three years. And, current estimates indicate that a large world oil supply shortfall of say 10 MMBD could reduce the U.S. GNP by as much as 7 percent.

As the U.S. becomes more dependent on imported oil, the potential costs of a supply disruption will rise. Therefore, to the extent that low oil prices or unwise public energy policies today increase U.S. import dependence, they create the potential for higher disruption costs.

National Security Implications of Increased U.S. Oil Import Dependence

Besides the economic costs of increased reliance on OPEC oil, such reliance can impose military and foreign policy burdens on the U.S. and other oil-importing nations. In brief, because of dependence on oil imports from the Middle East, the U.S. and other

oil importers may have to make military commitments and adopt foreign policies that they might not otherwise choose.

In addition, higher world oil prices benefit the Soviet Union, which is the world's largest oil and natural gas producer and holds enormous proved oil and gas reserves. Soviet oil reserves are estimated at 59 billion barrels, representing about 8 percent of world reserves and placing it behind only Saudi Arabia and Kuwait. Soviet natural gas reserves are estimated at 1,550 trillion cubic feet, representing 43 percent of the world's reserves.

In 1985, the Soviet Union exported 1.1 MMBD of oil to the West. Soviet policy is geared to increasing such exports, although it is uncertain whether the Soviets will be able to do so over the long-run. In addition, Soviet natural gas exports are about 0.6 MMBD oil equivalent. The United Nations Economic Commission estimates that Soviet natural gas exports will grow to one MMBD oil equivalent by 1990. Therefore, an increase in the world price of oil would benefit the Soviet Union significantly.[2]

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[2]For a more detailed discussion of the economic and national security implications of increased U.S. reliance on oil imports, see American Petroleum Institute, Domestic Petroleum Production and National Security, December 1986.

Benefits From Developing the ANWR Coastal Plain Oil Resources

The oil industry's position with regard to development of the ANWR Coastal Plain (the 1002 area) is straightforward. (1) Based upon government estimates of oil potential, the prospects for substantial finds of oil are excellent. (2) Development of the area's oil would provide significant national economic and security benefits. (3) Exploration and development can occur in an environmentally safe manner.

Oil Prospects in the ANWR Coastal Plain

The U.S. Department of the Interior's (DOI) April 1987 report, Arctic National Wildlife Refuge, Alaska, Coastal Plain Resource Assessment, concludes that if there is economically recoverable oil in the 1002 area, there is a 95 percent chance for more than 0.6 billion barrels and a 5 percent chance for more than 9.2 billion barrels of recoverable oil.[3] The mean estimate is 3.2 billion barrels. It should be emphasized that these are not estimates of the total amount of oil in the area, or the "in-place" oil, but rather are estimates of the economically recoverable oil. The mean in-place estimate is much higher -- 13.8 billion barrels. The DOI

[3]Although the DOI estimates that there is a 19 percent chance that economically recoverable oil will be found, the U.S. Department of Energy believes that there is an even higher likelihood. See U.S. Department of Energy, Energy Information Administration, Potential Oil Production from the Coastal Plain of the Arctic National Wildlife Refuge, October 1987.

also has estimated that the area holds huge quantities of natural gas (the mean in-place estimate is 31.3 trillion cubic feet), but the department notes that these resources may not be economic over the 30-year time period it considered. This may be so, but if production of such gas does prove economic in that period, each trillion cubic feel can provide the oil equivalent of 500,000 barrels per day for one year.

Opponents to opening the 1002 area to energy development allege that, in terms of total U.S. oil needs, the area would be likely to yield at most only a few months supply of oil. By this reasoning, no field has ever been or ever will be worth developing. Opponents of leasing fail to recognize that U.S. oil reserves are the accumulation of thousands of individual fields, that daily U.S. output is the sum of the contributions of those thousands of fields, and that many individual fields have been contributing to the nation's production over many years. The following facts put ANWR's oil potential in perspective:

o Using the mean estimate of 3.2 billion barrels of recoverable oil, the DOI estimates that the 1002 area would have peak production of 659,000 barrels per day. Such production would put this single area among the top 20 countries in the world in terms of crude oil production.

o The Interior Department's 3.2 billion barrel mean estimate of the 1002 area's recoverable oil would make the area the third largest oil find in U.S. history -- exceeded only by the Prudhoe Bay field (discovered in 1968 with an estimated 9.6 billion barrels of recoverable oil), which has produced more than 5 billion barrels of oil, and the East Texas field (discovered in 1930 with an estimated 5.6 billion barrels of recoverable oil), which has produced 4.9 billion barrels. If the department's high estimate of 9.2 billion barrels is realized, this would place ANWR close to Prudhoe Bay in the volume of oil discovered and would increase domestic crude oil reserves by one-third. In 1988, Alaskan production accounted for 25 percent of all the oil produced in the United States. But production from these fields resulted from long periods of exploration and development work and may well have begun to decline.

o If ANWR were to yield one million barrels per day for several years (toward the high end of the estimated range but quite possible), the reduction in U.S. demand for oil imports would be comparable to the import reduction that would be obtained by completely eliminating oil use in residential and commercial buildings in the U.S. during those years.

Thus, the oil potential of the ANWR Coastal Plain is enormous. As the Department of the Interior's ANWR report concluded, "The 1002 area is the nation's best single opportunity to increase

significantly domestic oil production over the next 40 years. It is rated by geologists as the most outstanding petroleum exploration target in the onshore United States. Data from nearby wells in the Prudhoe Bay area and in the Canadian Beaufort Sea and Mackenzie Delta, combined with promising seismic data gathered on the 1002 area, indicate extensions of producing trends and other geologic conditions exceptionally favorable for discovery of one or more supergiant fields (larger than 500 million barrels)."

Nevertheless, some have argued that ANWR should not be leased and that oil imports should be reduced by more energy conservation. While the petroleum industry fully supports the efficient use of energy in our economy, we are convinced that an effective national energy policy cannot be built on conservation alone. In reaching that conclusion, the American Petroleum Institute has attempted to determine, based on historical experience, what levels energy prices would have to reach to induce various degrees of improvement in energy efficiency. Our analysis indicates that just to hold aggregate U.S. energy consumption constant through the rest of the century while economic growth continues at modest rates, the price of energy would have to rise to three to four times present levels. And if we were to seek to substantially reduce aggregate U.S. energy consumption, say by 20 percent by the end of the century while still experiencing modest economic growth, the price of energy would have to rise by a factor of six or seven.

As noted earlier, U.S. oil production has been declining during the past three years and is expected to continue to do so. Thus, if government works solely on the demand side, it would have to intervene massively to stabilize or reduce energy imports. That is why it is important that the government take a balanced approach -- encouraging economically efficient conservation on the demand side but also removing unnecessary impediments to domestic production on the supply side.

National Economic and Security Benefits from Developing ANWR Oil Resources

If the area's recoverable oil resources turn out to be in the upper half of the 0.6-9.2 billion barrel range estimated by DOI, and full leasing occurs, peak oil production probably would equal at least one MMBD. It should be emphasized, however, that it takes as much as 10 to 15 years to explore for and place into production oil fields in hostile and distant environments such as the 1002 area. Even if ANWR leasing began expeditiously, peak production probably would not be achieved until the first decade of the twenty-first century. Given these realities, Congress should not wait until another oil crisis occurs to authorize leasing. In such circumstances, ANWR oil could not be found and developed in time to alleviate the crisis.

Development of the 1002 area would benefit the U.S. economy in four basic ways. First, based on the DOI's mean resource estimate and a study of the effects of offshore oil production which was prepared for API by Battelle Pacific Northwest Laboratories, API has estimated that ANWR production could add about a quarter of a million jobs nationwide by 2005. Assuming an average annual worker income of $25,000, total income of about $6 billion per year would be generated. Because so many specialized resources in the oil industry currently are unemployed, this $6 billion would represent a net economic gain.

Second, the larger national income from ANWR activity means a higher federal tax base and higher tax revenues. Also, federal leasing of ANWR 1002 lands would generate lease bonuses, and production from those lands would result in royalty payments, monies that would flow to the federal government as well as Alaska. Therefore, the leasing of the 1002 lands will help to reduce the federal budget deficit by expanding the nation's economy.

Additional national economic benefits from ANWR development would occur in the future because ANWR oil production would reduce U.S. oil import demand and, thereby, probably reduce the world oil price. Thus, ANWR development probably would provide national economic benefits in the form of lower future oil and other energy costs for American consumers.

The fourth type of economic benefit of ANWR production would occur because oil is an important input to so many sectors of the U.S. economy. More moderately priced oil will make many U.S. industries more productive.

The total benefit to the U.S. economy is a combination of the benefits described above. In addition, to the extent that ANWR oil development can add to U.S. supply, it will improve U.S. energy security and increase the flexibility of U.S. foreign policy. First, a significant level of ANWR oil production will reduce the chances of a foreign supply disruption that would have a sharp impact on the world oil price, since less U.S. demand for oil imports will increase slack in world oil markets. Secondly, should there be a disruption of world oil supplies, the costs to the U.S. economy will be reduced if U.S. oil import demand is less relative to its total oil supply. Finally, less U.S. dependence on foreign oil allows U.S. foreign policy to be more flexible and strengthens relationships with oil importing allies.

Environmental Considerations

Only a small portion of the ANWR Coastal Plain would actually be disturbed during exploration and production activities. Based on experience at nearby Prudhoe Bay, less than one-tenth of one percent of ANWR would be affected by drilling and production pads, roads and facilities.

The petroleum industry's record in developing the producing fields on the Alaskan North Slope provides solid evidence that such operations can be and are being conducted in an environmentally sound manner. The advanced technology developed from arctic operations near Prudhoe Bay -- the area of the nation's largest oil and gas fields -- can be used within ANWR in the search for the large deposits of crude oil that may underlie the 1002 area.

Numerous laws and regulations assure that oil and gas activities are designed to protect the surrounding environment. Experience in Alaska and the lower 48 states shows that oil and gas activities are compatible with other goals such as wildlife protection. Nearly 20 years of experience on the North Slope demonstrates that oil and gas exploration and development can exist in harmony with the arctic environment. Techniques to minimize disturbance include directional drilling, smaller and consolidated facilities, winter construction, use of special arctic equipment, and elevated pipelines and facilities. The U.S. Fish and Wildlife Service (USFWS) monitored all of the surface activities and geophysical operations conducted on the Coastal Plain and reported that no significant environmental impact resulted from that activity.

Oil from the 1002 area would be transported by onshore pipeline to the existing Trans-Alaska Pipeline System (TAPS), which probably will have substantial surplus capacity when ANWR

production begins. Experience from TAPS and the Prudhoe Bay, Milne Point and Kuparuk developments indicates that pipelines can be designed, constructed and operated on the North Slope to allow passage of caribou and other wildlife.

Development at Prudhoe Bay, Kuparuk, and Milne Point in the calving range of the Central Arctic caribou has not had a harmful effect on this caribou herd. According to U.S. Department of Interior data, the herd grew from about 3,000 animals in 1970 to some 15,000 in 1985. This experience is reason to believe that development in the 1002 area would not hurt the Porcupine caribou herd. The 1002 area is only a portion of the calving grounds of the Porcupine herd. Even discovery of a supergiant field would only involve a small portion of the area. And in some years, little or no calving occurs in the 1002 area, but takes place in the foothills to the south or in Canada.

Oil and gas operations also would be compatible with other wildlife and environmental aspects of the 1002 area. Moreover, all 1002 area facilities will require air quality permits to construct and operate. Air quality monitoring at the large Prudhoe Bay facilities and the other North Slope oil fields shows that oil and gas operations at these locations fully meet state and federal air quality standards.

Finally, the petroleum industry recognizes that there is some chance that the ANWR Coastal Plain will not contain economically recoverable quantities of oil. However, if this occurs, whatever disturbance of the area there is by petroleum exploration activities would cease and restoration measures would begin. And if economically significant oil and gas discoveries were made, the occupation of the area would last only as long as those discoveries were producible, perhaps 30 to 40 years -- a very short time in man's historical use of the area. Once operations end, the land would be restored to a natural state. Thus, there is little to lose by permitting leasing and development and potentially a great deal to gain.

MAR 15 1989

Canadian Embassy

Ambassade du Canada
501 Pennsylvania Ave. N.W.
Washington, D.C. 20001

March 14, 1989

OFFICIAL COMMITTEE FILE
PLEASE RETURN

The Honourable J. Bennett Johnston, Jr., Chairman
Committee on Energy and Natural Resources
United States Senate
Hart Senate Office Bldg., Rm. 136
Washington, D.C. 20510-1802

Dear Senator Johnston,

Your Committee is about to mark up a bill on the Arctic National Wildlife Refuge (ANWR). Our principal concern with the bill is that development of ANWR will disrupt the sensitive calving grounds and migratory patterns of the Porcupine Caribou Herd, upon which thousands of Canadian native peoples subsist. I am writing, therefore, to reiterate Canada's preference that the lands in question be designated as wilderness, as the best way of assuring the future of the many shared, wildlife populations of the coastal plain.

The Alaska National Interest Lands Act of 1980 recognized Canada's interest in the consequences of development in ANWR. The American and Canadian joint responsibility for protecting the shared Caribou herd is further recognized in the 1987 Agreement for the Conservation of the Porcupine Caribou Herd (PCH). We believe it appropriate that the board created by the agreement be heard from before any decision is taken to open ANWR.

In 1984, Canada created the Northern Yukon National Park (NYNP) to protect the PCH calving grounds within our borders. Oil and gas exploration or development is not permitted within the park. We are prepared to consider twinning NYNP with ANWR to give tangible expression to the unique value of these two areas.

I would be pleased to discuss this subject further with you, at your convenience.

Yours sincerely,

D.H. Burney
Ambassador

COMMITTEE ON ENERGY AND NATURAL RESOURCES
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WASHINGTON, D.C. 20510